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CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT

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PLEASE NOTE

This report presents unevaluated information extracted from recently received publications of the USSR and Eastern Europe. The information selected is intended to indicate current scientific developments and activities and is disseminated as an aid to research in the United States.

SCIENTIFIC INFORMATION REPORT

Table of Contents

I. BIOLOGY

Radiobiology

1. Changes in pH and rH_2 of Plants Subjected to Ultraviolet Irradiation

"The Effect of Ultraviolet Radiation on the pH and rH_2 of Plant Cells," by A. P. Dubrov, Laboratory of Photobiology, Institute of Biological Physics, Academy of Sciences USSR; Moscow, Tsitologiya, Vol 2, No 2, Mar/Apr 60, pp 161-169

Research was conducted on changes occurring in the hydrogen ion concentration and the oxidation-reduction potential in the epidermal cells of the skins of Allium cepa onion bulbs by the use of diachromatic dye stuffs and fluorochromes.

The author presents the following conclusions:

1. Ultraviolet irradiation of epidermal cells causes changes in the pH and rH_2 which depend both on the magnitude of the dose and on the time elapsing after irradiation.

2. The oxidation-reduction potential of the cells is more sensitive than the pH to the effect of ultraviolet irradiation.

3. The electrical charge of the nucleproteids is subjected to a severe change, which explains, to a certain degree, the acute sensitivity of the nucleus to the action of ultraviolet irradiation.

4. Profound changes in pH and rH_2 are accompanied, possibly, by the inactivation of the enzymatic system and by the photolysis of the cell content, which lead to the death of the cell.

5. The buffering properties of the various cell parts with regard to pH and rH_2 decrease in the following order: vacuoles, nucleolus, nucleus, and cytoplasm.

2. Radiosensitivity of Plant Seeds Dependent on Their Functional Activity

"The Effect of the State of Plant Cells on Their Radiosensitivity to Gamma-Irradiation," by T. G. Mamedov, Biological-Soil Faculty of Moscow University; Moscow, Tsitologiya, Vol 2, No 2, Mar/Apr 60, pp 175-178

A study was conducted on the changes in the radiosensitivity of the meristematic cells of the primary rootlets of the seeds of Vicia faba subjected to irradiation under various functional conditions; a further study

was conducted on the dynamics of postirradiation changes in the growth rate of the rootlets subjected to irradiation at different stages of development.

It was found that the radiosensitivity of the wetted seeds was approximately 4.5 times, that of sprouting seeds 15 times, that of 3-day-old sprouts 42 times, and that of 7-day-old sprouts 32 times that of the dry seeds.

It was also established that the recovery of the rootlets from a decreased rate of growth due to low doses of irradiation (60, 90, and 150 r) occurs on the 5th-7th day after irradiation; but there is no recovery from the decreased rate of growth of the rootlets subjected to high doses (270 r).

Miscellaneous

3. Conference on Biophysics Emphasizes the Introduction of Biophysics Into Biology

"Discoveries of Biophysicists" (unsigned article); Moscow, Izvestiya, 3 Jul 60, p 5

"A scientific conference which was organized by the Institute of Biophysics of the Academy of Sciences USSR, the Institute of Physiology imeni Bogomolets of the Academy of Sciences UkSSR, and the Ukrainian Republican Society of Roentgenologists and Radiologists convened in Kiev.

We asked one of the organizers of this conference, Prof A. A. Gorodetskiy, the Head of the Laboratory of Biophysics, Institute imeni Bogomolets, to discuss the purpose of this conference.

"[Gorodetskiy said:] Biophysics is the science which stands on the boundary line between biology, medicine, physics, chemistry, and biochemistry. This conference was dedicated to recent achievements in these sciences and to their introduction into biology.

"A whole series of phenomena can occur in a millionth of a second and, therefore, cannot be subjected to the usual methods of observation. For example, after the action of X-rays on an organism, so-called radicals which induce disease-producing phenomena appear. Therefore, to combat these phenomena, the process of the formation of the radicals must be studied first. Such a study has become possible by the method of paramagnetic resonance. This method was discovered by Soviet scientists. A special session of the conference was devoted to the methods of research which make use of electronics and molecular physics.

"It is known that many problems connected with the improvement of the health of an organism are based on the regeneration (restoration) of tissues, organs, and the organism as a whole. Learning to control regeneration is

a fervent hope of man. Soviet scientists have established that radiation injuries inhibit regeneration. This conference discussed a number of chemical substances which decrease this harmful effect and which constitute active means of combating radiation injuries. Data on this subject were presented by Prof G. S. Strelin, B. P. Kalashnikov, and our laboratory.

"A very interesting report was presented by A. M. Kuzin, corresponding member of the Academy of Sciences USSR. He and his colleagues have isolated, concentrated, and chemically identified a substance which is formed in tissues which have been exposed to the effect of radiation and which then penetrates into uninjured areas. This research of Kuzin and his colleagues permits us to pose the question of the possibility of preparing protective measures (antidotes). These problems were discussed at a session devoted to the mechanism of the action of radiation.

"In conclusion, Prof A. A. Gorodetskiy said that we biophysicists consider that the achievements of this science form the basis for progress in many natural sciences."

4. Irradiation of Vegetables With High-Frequency Radiowaves

"Control of Onion and Garlic Pests" (unsigned article); Moscow, Ekonomicheskaya Gazeta, 2 Jul 60, p 4

Experiments are being conducted with the irradiation of garlic and onions by very fast electromagnetic vibrations. The vegetables are placed between condenser plates of a high-frequency generator. The normal parasites of onions and garlic -- acarids and nematodes -- and the mold fungus which attacks these vegetables were completely killed after a 5-minute irradiation with the radiowaves, according to the report.

Treatment of the vegetables can be done either on a moving conveyer belt or after the vegetables have been packed in normal containers (weighing up to 25 kg).

II. CHEMISTRY

Fuels and Propellants

5. Combustion of Hydrazine Nitrate

"The Chemical Decomposition and Combustion of Hydrazine Nitrate," by A. A. Shidlovskiy, V. I. Semishin, and V. I. Simutin, Moscow Institute of Chemical Machine Building; Moscow, Zhurnal Prikladnoy Khimii, Vol 33, No 6, Jun 60, pp 1411-1413

It was established that at elevated temperatures (180° and higher) hydrazine nitrate ($N_2H_4.HNO_3$) has a lower thermal stability than ammonium nitrate. Hydrazine nitrate flashes at 270°. Addition of potassium bichromate to hydrazine nitrate lowers the thermal stability of the latter. At room temperature and atmospheric pressure, hydrazine nitrate is not capable of stable combustion in a tube with a diameter of 20 mm. In accordance with the general relationships pertaining to the theory of combustion, hydrazine nitrate acquires the capacity to undergo stable combustion at atmospheric pressure in a tube with a diameter of 20 mm (a) after it has been heated to at least 90-100° and (b) after a small quantity of a substance that lowers its thermal stability and functions as a combustion catalyst, e.g., potassium bichromate, has been added to it. Addition of potassium bichromate to a mixture of hydrazine nitrate with ammonium nitrate also makes this mixture capable of burning at atmospheric pressure.

6. Effect of Additives and Impurities on the Thermal Decomposition of Potassium Picrate

"On the Chemical Factors Which Influence the Thermal Decomposition of Potassium Picrate," by Z. G. Szabo and J. Szava, Szeged University's Inorganic and Analytical Chemistry Institute and Budapest Mining Research Institute; Budapest, Magyar Kemiai Folyoirat, Vol 66, No 6, Jun 60, pp 227-234

The thermal decomposition of potassium picrate was investigated under the most diverse conditions. It was established that in addition to physical parameters such as the temperature, pressure, particle size, and quantity of substance used, certain chemical factors such as an extraneous gas atmosphere, presence of impurities, and the degree of decomposition due to preliminary heat treatment may exert a considerable influence on the kinetics of the thermal decomposition.

The authors investigated the effects of noble gases, nitrogen, carbon dioxide, hydrogen, and oxygen on the thermal decomposition of potassium picrate and, using results obtained by other investigators, compared them with the effects produced by the same substances on the decomposition of

other explosive and combustible compounds (silver oxalate, copper oxalate, ammonium perchlorate, guanidine perchlorate, mercury fulminate, nickel formiate, and trinitrotriazidobenzene). The effects exerted by NH_3, H_2O, NO_3, MgO, Cr_2O_3, TiO_2, V_2O_5, Fe_2O_3, CuO, and Pt on the other compounds mentioned, as established in published work that is referred to in footnotes, are also considered and included in a general tabulation of data (cf Table 5, p 233). The table includes Data in regard to the influence of K^+ on the behavior of potassium picrate.

7. Addition of Nitroalkanes to β β-Dimethylvinylketone

"On the Addition of Nitroalkanes to β, β-Dimethylvinylketone," by S. S. Novikov, I. S. Korsakova, and N. N. Bulatova, Moscow Engineering Physics Institute; Ivanovo, Izvestiya Vysshikh Uchebnykh Zavedeniy Khimiya i Khimicheskaya Tekhnologiya, Vol 3, No 1, 1960, pp 132-134

The addition of the nitroalkanes $CH(NO_3)$, $CH_2(NO_2)_2$, $CH_3CH(NO_2)_2$, and CH_3NO_2 and mononitroacetic acid ester $NO_2CH_2COOC_2H_5$ and dinitroacetic acid ester $(NO_2)_2CHCOOC_2H_5$ to β, β-dimethylvinylketone was investigated. The formulas, yields, and characteristics of the substances obtained are listed tabularly.

Industrial Chemistry

8. New Czechoslovak Ultracentrifuge

"A Czechoslovak Ultracentrifuge," by F. Einhorn, Scientific Associate-Designer, Czechoslovak Academy of Sciences, Moscow, Ekonomicheskaya Gazeta, No 21 (693), 24 Jun 60, p 4

The new Czechoslovak ultracentrifuge of the UC-2 type aroused considerable interest when it was shown for the first time at an exhibition in Moscow. The ultracentrifuge in question was originally designed for the purpose of measuring adhesion between different types of materials and protective coatings applied to these materials. Adhesion measurements of this type have become of particular importance at the present stage of development of aviation and astronautics. The methods of measuring adhesion available hitherto were inadequate and not precise enough: it was necessary to construct equipment with a maximum centrifugal force capable of overcoming an adhesion force amounting to 60 kilograms per square millimeter. This has now been done. The rotor of the centrifuge developing centrifugal forces of this order is suspended magnetically and rotates in vacuum. Because the rotor is not subjected to any

mechanical friction, it speeds up on direct switching in of a frequency of 100 kilocycles, operates as an induction motor with a great slip, and can even approach synchronous rotation if the vacuum is high enough. In the UC-2 ultracentrifuge, a vacuum of the order of 10^{-7} millimeters of mercury is reached.

The original type of ultracentrifuge designed and constructed in Czechoslovakia had a maximum number of rotations amounting to 3.6 million per minute. The UC-2 ultracentrifuge develops a velocity of up to 6 million rotations per minute. This means that the centrifugal force developed in this type of equipment is high enough, not only to tear a protective paint coating from the surface of the rotor but also to detach electrolytically deposited coatings, the degree of adhesion of which could not be measured hitherto.

The ultracentrifuge can be used for determining the strength of materials. For instance, a 10-mm high-allpy steel ball from a ball bearing, when used as a rotor in the ultracentrifuge, can stand 1.8 million rotations per minute. When the centrifugal force is increased further, the rotating ball is destroyed because the force applied to it exceeds the strength of molecular adhesion.

The ultracentrifuge can also be used as a vacuum gauge. Because the only force which slows down the magnetically suspended rotor is due to the friction of residual gas, one can measure the friction of this gas even in high vacuum: the slowing down of the rotation because of the gas friction can be determined with a precision not attainable hitherto.

At present, work is being done on a magnetically suspended ultracentrifuge for sedimentation measurements. This ultracentrifuge will be equipped with a concentrically located cuvette which can be observed by means of a special television device. With an ultracentrifuge of this type, it will be possible to determine sedimentation gradients without the use of complex and relatively ineffective optical devices. It is expected that the new ultricentrifuge will be used extensively in investigations on viruses and bacteriophages, as well as for the concentration of materials applied in immunization, and in physical chemistry for the investigation of molecules (specifically macromolecules), determinations of molecular weight, etc.

By applying the very intense gravitational fields that can now be developed by means of the new ultracentrifuge, it will be possible to obtain entirely new data in the hitherto little investigated field of structurally unstable elements and also to advance work on the concentration of isotopes and the separation of neutrons.

[SIR Note: An illustration which accompanies the article shows the author of the article together with Academician A. N. Tupolev and A. I. Mikoyan, Corresponding Member Academy of Sciences USSR. According to the caption, the author is giving information on the new ultracentrifuge to them].

9. Application of Nitrogen Oxides in the Preparation of Modified Celluloses

"The Application of Nitrogen Oxides in the Preparation of Modified Celluloses," by I. N. Yermolenko and F. N. Kaputskiy; Moscow, Vysokomolekulyarnyye Soyedineniya, No 4, Apr 60, p 626

For the preparation of modified cellulose, a method of incorporating reactive macroradicals into the macromolecules has been proposed, in which the distinguishing feature is the use of nitrogen peroxide and phosphoric acid. At temperatures of 0-10°C, phosphorus-containing fireproof products have been obtained.

10. Synthesis of High Molecular Aromatic Polyamides by Interfacial Polycondensation in Acid Media

"Synthesis of High-Molecular Aromatic Polyamides by Interfacial Polycondensation in Acid Media," by L. B. Sokolov and T. V. Kudim, Scientific Research Institute of Synthetic Resins (Vladimir); Moscow, Vysokomolekulyarnyye Soyedineniya, No 5, 1960, pp 698-703

The interfacial polycondensation of aromatic diamines with aromatic dicarboxylic acid chlorides has been investigated over a wide range of pH values of the aqueous phase. It has been shown that polyamides of the highest molecular weights are formed in the acid region. Investigation of aromatic polyamides is desirable because substances of this class may be expected to exhibit a higher thermal stability.

11. Inorganic Ion Exchange on Carboxyl Cation Exchangers in Water-Methanol Mixtures

"Inorganic Ion Exchange on Carboxyl Cation Exchangers in Water-Methanol Mixtures," by Lou Chih-hsien, Ye. M. Savitskaya, and B. P. Bruns, All-Union Scientific Research Institute of Antibiotics; Moscow, Vysokomolekulyarnyye Soyedineniya, No 5, 1960, pp 751-758

The course of inorganic ion exchange on monofunctional carboxyl resins in water-methanol mixtures of varying composition has been investigated.

The rate of exchange diminishes with increasing methanol content in the mixture. In the case of the salt forms of the resin, the fall in the rate is connected with a decrease in the specific volume of the exchangers

in that form with increasing methanol content. The reduction of the rate in the case of the hydrogen forms under the same conditions is probably due to a decrease in the value of the dissociation constant of the carboxyl exchanger. The equilibrium value of relative acidity of the medium expressed through pH_p at which the same degree of substitution of the H-ions of the resin with metal ions is attained increases with the methanol concentration.

12. Effect of Dispersed Aminated Bentonite in the Monomer on the Strength of Polymethylmethacrylate

"Filled Polymers. II. The Effect of Dispersing Aminated Bentonite in the Monomer on the Reinforcement of Polymethylmethacrylate," by I. A. Uskov and T. A. Kusnitsyna, Kiev State University imeni T. G. Shevchenko; Moscow, Vysokomolekulyarnyye Soyedineniya, No 5, May 60, pp 728-730

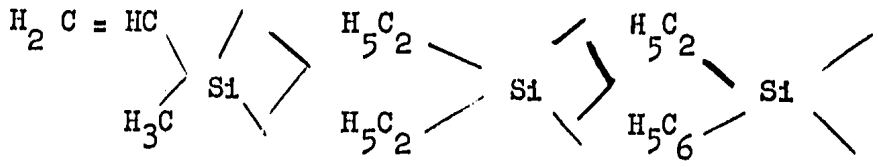
Highly dispersed octadecylaminated bentonite was incorporated in polymethylmethacrylate by fine dispersion in the monomer medium containing the polymerization initiator (benzoylperoxide). The ultimate dispersion of the filler to primary particles carried out in the monomer medium by processing in a vibration mill and the uniform distribution of the filler throughout the entire body of the polymer led to a considerable increase in the hardness of the polymer in the vitreous state and to an improvement of its thermal stability. The resultant material is 47% harder than pure polymethylmethacrylate, and its flow temperature is raised by no less than 60°.

13. Synthesis and Polymerization of Mixed 8-Membered Organosiloxanes

"Synthesis and Polymerization of Mixed 8-Membered Organosiloxanes," by K. A. Andrianov, L. M. Khananashvili, and Yu. F. Koporshenko, Moscow Institute of Fine Chemical Technology imeni M. V. Lomonosov; Moscow, Vysokomolekulyarnyye Soyedineniya, No 5, May 60, pp 719-727

The joint hydrolysis of dimethyldichlorosilane and methylvinyldichlorosilane yielded the following new compounds: heptamethylvinylcyclotetrasiloxane, hexamethyldivinylcyclotetrasiloxane, and pentamethyltrivinylcyclotetrasiloxane. By the joint hydrolysis of dimethyldichlorosilane and diethyldichlorosilane, hexamethyldiethylcyclotetrasiloxane was obtained. The joint hydrolysis of dimethyldichlorosilane and ethylphenyldiethoxysilane produced hexamethylethylphenylcyclotetrasiloxane.

The catalytic polymerization of the organosiloxanes was investigated, and it was found that according to the intensity of their effect upon the degree of polymerization, the organosiloxane groups in the 8- membered ring arrange themselves in the following series:



14. Phosphorus-Containing Polymers

"Phosphorus-Containing Polymers. II. The Application of the Arbuzov Rearrangement for the Synthesis of Polyphosphonates," by K. A. Petrov, E. Ye. Nifant'yev, and I. I. Sopikova; Moscow, Vysokomolekulyarnyye Soyedineniya, No 5, May 60, pp 685-688

Cyclic phosphinites not described hitherto can be obtained by the reaction of dichlorophosphines with glycols. The reaction leads to the desired result if phenyldichlorophosphine is employed as the dichlorophosphine and a 1,3-glycol as the glycol. The resulting compounds polymerize on heating with a small quantity of methyl iodide in a sealed tube (per-one mol of phosphinite, 0.001-0.1 mol of methyl iodide is employed). The compounds formed are polyphosphonates with a molecular weight of 270-3200. The structure of the polymers has been elucidated on the basis of their decomposition with phosphorus pentachloride, yielding phenyl- (1-methyl-3-chloropropyl) phosphinyl chloride. The above procedure is a novel method of synthesizing phosphorus-containing polymers.

15. Studies of Coordination Polymers

"Studies of Coordination Polymers. IV. Synthesis of Polymers on the Basis of Aromatic bis- (β-Diketones) With Metals, by V. V. Korshak, Ye. S. Krongaus, and V. Ye. Sheina, Institute of Organoelemental Compounds; Moscow, Vysokomolekulyarnyye Soyedineniya, No 5, May 60, pp 662-672

A description is given of the synthesis of some aromatic bis- (β-diketones)including isophthalyldiacetophenone, 4,4'-bis (acetoacetyl) diphenylmethane, 4, 4'-bis (acetoacetyl) diphenyl, and β, β, β', β'-tetraacetyldiethylbenzene. The compounds have been used as the basis for the formation of polymers containing Be, Cu, Ni, Co, Zn, Cd, and Mn. The relation between the properties of the polymers and the structure

of the original bis- (β-diketones) is discussed. It was established that the thermal stability of the polymers synthesized, as affected by the metal which enters into their composition, diminishes in the following sequence: Cu > Be > Ni > Co > Zn > Mn > Cd.

16. Synthesis of Polydimethylsiloxyalkylenefumarates and Their Copolymerization With Styrene

"Synthesis of Polydimethylsiloxyalkylenefumarates and Their Copolymerization With Styrene," by M. A. Bulatov and S. S. Spasskiy, Chemistry Institute, Ural Affiliate Academy of Sciences USSR; Moscow, Vysokomolekulyarnyye Soyedineniya, No 5, May 60, pp 658-661

The alcoholysis of dimethyldiethoxysilane by low-molecular glycol polyesters of fumaric acid containing OH-groups yielded silicon-containing polyesters capable of copolymerization with vinyl monomers to form insoluble solids.

A study of the copolymerization of these polyesters with styrene showed that incorporation of organosiloxane units in the polyester chain has no significant effect on the character of the copolymerization.

17. Methacrylyltriethyl-Germanium -- Its Synthesis and Polymerization

"Carbochain Polymers and Copolymers. XXII. Methacrylyltriethyl-Germanium, Synthesis and Polymerization," by H. S. Kolesnikov, S. L. Davydova, and N. V. Klimentova, Institute of Organoelemental Compounds, Academy of Sciences USSR; Moscow, Vysokomolekulyarnyye Soyedineniya, No 4, Apr 60, pp 563-566

Methacrylyltriethylgermanium has been synthesized for the first time, and its polymer and styrene and methylmethacrylate copolymers have been obtained. The thermomechanical properties of the polymers have been determined.

18. Copolymerization of the Diallyl Derivatives of Germanium, Tin, and Silicon With Styrene and Methylmethacrylate in the Presence of Benzoyl Peroxide

"Carbochain Polymers and Copolymers. XXIII. Copolymerization of the Diallyl Derivatives of Germanium, Tin, and Silicon With Styrene and Methylmethacrylate in the Presence of Benzoyl Peroxide," by H. S. Kolesnikov, S. L. Davydova, T. I. Yermolayeva, N. D. Shilova, and M. B. Bykhovskaya, Institute of Organoelemental Compounds, Academy of Sciences USSR; Moscow, Vysokomolekulyarnyye Soyedineniya, No 4, Apr 60, pp 567-571

The copolymers of the diallyl derivatives of germanium, tin, and silicon with styrene and methylmethacrylate have been synthesized and their properties investigated. It has been shown that an increase in the content of the organoelemental compound in the initial monomer mixture leads to a fall in the molecular weight of the copolymer.

19. Mercurated Butadiene Rubbers

"Mercurated Rubbers. I. Mercurated Butadiene Rubbers," by R. N. Smirnov, Institute of Mineral Fuels, Academy of Sciences USSR; Moscow, Vysokomolekulyarnyye Soyedineniya, No 4, Apr 60, pp 558-562

The mercuration of four butadiene rubbers has been investigated. A procedure for carrying out the reaction both homogeneously and heterogeneously has been proposed which leads to compounds of the type (rubber) OR·· Hg $OCOCH_3$. Mercuration, not only of the double bonds, but also of the methylene groups has been observed. Transition of the rubbers from the amorphous to the crystalline state on mercuration has been noted. Mercurated butadiene rubbers have been found to be of low thermal stability, to electrify on friction, to be easily subject to mechanochemical processes, to be electrical conductors, and to exhibit a sharp decrease in elasticity.

20. Polymerization of Isoprene by Organomagnesium Compounds

"Polymerization of Isoprene by Organomagnesium Compounds," by Wang Fou-sung, B. A. Dolgoplosk, and B. L. Yerusalimskiy, Institute of High-Molecular Compounds, Academy of Sciences USSR; Moscow, Vysokomolekulyarnyye Soyedineniya, No 4, Apr 60, pp 541-545

Organomagnesium compounds of the types RMgX and R_2Mg that are free of ether induce the polymerization of isoprene at 80-90°C. The polyisoprene obtained under such conditions is composed almost entirely of 3,4-links. It is characterized by a reduced degree of unsaturation while

preserving complete solubility in benzene. The nature of the halogen in the organomagnesium compound does not influence the microstructure of the polymeric chain. Complexing agents (diethyl ether and triethylamine) lower the polymerization rate and the 3,4-links content. The vitrification temperature of the polymers is ca. minus 10°; the intrinsic viscosity, 0.75-0.95.

21. Some Coordination Polymers of Quinizarin With Metals

"Studies in Coordination-Chain Polymers. II. Some Polymers of Quinizarin With Metals," by V. V. Korshak, S. V. Vinogradova, and V. S. Artemova, Institute of Organoelemental Compounds, Academy of Sciences USSR; Moscow, Vysokomolekulyarnyye Soyedineniya, No 4, Apr 60, pp 492-497

Coordination polymers of quinizarin and zinc, copper, nickel, cobalt, cadmium, and manganese have been synthesized and investigated. It was found that the thermal stability of the polymers in question diminishes in the following sequence:

Ni >Zn> Mn >Cd> Cu >Co

22. Coordination Polymers Derived From Bis- (8-Hydroxyquinolyl) Methane

"Studies in Coordination-Chain Polymers. III. Coordination Polymers on the Basis of bis- (8-Hydroxyquinolyl) Methane," V. V. Korshak, S. V. Vinogradova, and T. M. Babchinitser, Institute of Organoelemental Compounds, Academy of Sciences USSR; Moscow, Vysokomolekulyarnyye Soyedineniya, No 4, Apr 60, pp 498-507

The synthesis and properties of the coordination polymers of bis- (8-hydroxyquinolyl) methane with zinc, copper, manganese, nickel, cobalt, or cadmium are described. Mixed zinc-copper and zinc-cadmium coordination polymers of bis- (8-hydroxyquinolyl) methane and bis- (8-hydroxyquinolyl) methane-quinizarin polymers with zinc, copper, nickel, cobalt, or manganese have also been prepared.

Inorganic Chemistry

23. Ammonium Salts of Fluoroboric Acids

"Ammonium Salts of Fluoroboric Acids," by I. G. Ryss and L. P. Bogdanova, Dnepropetrovsk Institute of Railroad Transportation; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 5, May 60, pp 1028-1035.

A method is described for synthesizing $(NH_4)_2$ $[B_3O_3F_4OH]$ by the reaction of ammonium bifluoride (NH_4HF_2) with boric acid. The solubilities and thermal decomposition of the salt obtained were investigated. It was established that $(NH_4)_2$ $[B_3O_3F_4OH]$ reacts with concentrated solutions of NH_4F. However, the products of the reaction cannot be separated because they are extremely soluble in water. They apparently exhibit an incongruent solubility. A synthesis of $NH_4[BF_3OH]$ by a procedure described resulted in the formation of a product that was not entirely pure and proved to be very soluble in water. The substance to which G. I. Petrenko assigned the formula $B_2O_3 \cdot NH_4F \cdot HF$ was found to consist of a mixture of $(NH_4)_2$ $[B_3O_3F_4OH]$ with H_3BO_3 and possibly ammonium borates.

The substance to which Sweinhart gave the formula $(NH_4)_2[O(BF_3)_4]$ was found to be an inhomogeneous mixture, the principal component of which is NH_4BF_4.

Nuclear Fuels and Reactor Construction Materials

24. Isotope Composition of Uranium Found in Nature

"The Isotope Composition of Uranium Found in Nature," by Ye. A. Isabayev, E. P. Usatov, and V. V. Cherdyntsev; Leningrad, Radiokhimiya, Vol 2, No 1, Feb 60, pp 94-97

It was established that the relative content of uranium isotopes in minerals containing an excess of actinium does not deviate from the normal. The ratio U II / U I (U^{234} / U^{238}) in secondary minerals and natural waters is subject to considerable variations. The analysis of 29 samples of water derived from granite massifs indicated fluctuation of this ratio from 0.72 to 7.8. On the average, this ratio is equal to 3 and in no case comes close to that corresponding to a state of equilibrium.

25. Investigation of the Actinium Content of Some Minerals

"Investigation of Actinium in Natural Objects," by Ye. A. Isabayev, U. Kh. Asylbayev, and V. V. Cherdyntsev; Leningrad, Radiokhimiya, Vol 2, No 1, Feb 60, pp 98-103

In recent years, a number of investigations of the actinium content have been carried out on natural objects in which the relative content of radioactive substances does not correspond to a state of equilibrium. It was established that a ratio of actinium to radium higher than normal is often exhibited by (1) secondary minerals which have lost radium as a result of migration, (2) recently formed secondary minerals which are enriched with uranium, and (3) natural waters. In the majority of objects investigated, actinium was found to be in equilibrium with decay products (viz. radioactinium and actinium-X). This applies to all the objects investigated with the exception of natural waters. As distinguished from the secondary minerals mentioned above the natural waters, certain primary minerals of the hydrothermal phase contain an excess of actinium. The presence of excess actinium is presumably due to some nuclear process as a result of which this element accumulates. The investigation described was done with the purpose of developing a method for the determination of actinium in the presence of thorium and of applying this method to the investigation of anomalous minerals containing an excess of actinium.

Two methods independent of each other were applied for the determination of small quantities of actinium, i.e., determination of Ac C and ThC in an active deposit by means of an α-radiation analyzer and determination of An [actimon] and Ac A on the basis of a count of delayed pulses using an installation with two luminescence counters. By employing this procedure, it could be confirmed that there are primary minerals containing an excess of actinium. It was also established that among secondary minerals, there are some in which the actinium to radium ratio is greatly increased because of a loss of radium.

26. Working of Uranium by the Application of Pressure

"Some Aspects of the Application of Force and Deformation in the Pressure Working of Uranium," by I. L. Perlin, I. D. Nikitin, V. A. Fedorchenko, A. D. Nikulin, and N. G. Reshetnikov; Moscow, Atomnaya Energiya, Vol 8, No 3, Mar 60, pp 219-227

To determine the best conditions for the working of uranium by pressure with the purpose of the production of sheets, rods, tubes, and other shapes, an investigation has been carried out of the types of deformation produced and aspects of the application of force which are involved in

this type of working of the metal in question. The dependence on the temperature of the workability of uranium by rolling and the dependence of the average specific pressure exerted by uranium on the rolls, as well as of the absolute widening on the degree of thickness reduction (in the range of 10-50%) and the temperature (in the range of 400-1,000°C), have been determined. Calculation of the average specific pressure of uranium on the rolls according to A. I. Tselikov's analytical formula showed that there is good agreement between the calculated values and experimental data. The dependence of the stress due to pressing on the degree of elongation (up to a factor of 54), the temperature (in the range of 250-800°C), and the reduction of the diameter (the ratio between the diameters of protective casings is equal to 5) has been studied. The concepts of susceptibility to working by pressure (pressability) and of the modulus of pressure stress are introduced. Methods are proposed for their calculation, and their dependence on the temperature has been determined. The dependence of the drawing stress and of the safety factor on the degree of deformation (in the range of 5.5-34%) have been investigated.

27. Formation of Complexes by Uranyl Nitrate With Organophosphorus Compounds

"Investigation of the Formation of Complexes by Uranyl Nitrate With Organophosphorus Compounds; Part 2," by M. F. Pushlenkov, G. P. Nikitina, and V. G. Voden; Leningrad, Radiokhimiya, Vol 2, No 2, Apr 60, pp 215-221

It was established that the composition of the coordination compound formed by uranyl nitrate with the n-butyl ester of di-n-butyl phosphinic acid (BEDBP) corresponds to the formula $UO_2(NO_3)_2 \cdot 2$ BEDBP. The association constants of $UO_2(NO_3)_2 \cdot 2$ DBEBP (di-n-butyl ester of n-butylphosphinic acid) and $UO_2(NO_3)_2 \cdot 2$ BEDBP have been determined and found to be equal to 6.03×10^2 and 2.96×10^4, respectively. The curvature of

$$\ln S = f\,[NO_3^-]_B;\quad \mu,\ [H^+]_B,\ [T]_o = \text{const.}$$

in the case of TBPO (tri-n-butylphosphinoxide) is apparently due to transfer into the organic phase of the complexes

$UO_2\,NO_3\,Cl\,O_4 \cdot 2$ TBPO and $UO_2\,Cl\,O_4)_2 \cdot 2$TBBPO together with $UO_2(NO_3)_2 \cdot 2$ TBTO.

28. Structure of Uranyl Nitrate Hexahydrate

"The Structure of the Hexahydrate of Uranyl Nitrate," by V. M. Vdovenko, Ye. V. Stroganov, A. P. Sokolov, and V. N. Zandin (deceased); Leningrad, Radiokhimiya, Vol 2, No 1, Feb 60, pp 24-31

By using Fourier analysis, the positions of uranium atoms in the crystal of uranyl nitrate hexahydrate were determined. It was established that the crystal consists of the complex cations $[UO_2(H_2O)_6]^{2+}$ and NO_3^- anions. It is proposed in connection with this that the chemical formula of uranyl nitrate hexahydrate be written in the form $[UO_2(H_2O)_6](NO_3)_2$. It was established that the structure of the complex cation in the crystal differs little from that of the hydrated uranyl ion in aqueous solutions.

29. Coprecipitation of Trivalent Cerium With Uranium Oxalate

"Coprecipitation of Trivalent Cerium With Uranium Oxalate." by D. N. Bykhovskiy and A. A. Grinberg; Leningrad, Radiokhimiya, Vol 2, No 2, Apr 60, pp 164-174

Investigation of the regularities underlying capture of cerium (III) by uranium oxalate precipitated from a supersaturated solution and the dependence of the amounts of cerium coprecipitated on the concentration of oxalate ions, the concentration of cerium, and the concentration of some impurities indicated that in the system under consideration equilibrium is established with great difficulty and that for all practical purposes the mixed crystals which form are never in equilibrium with the solution. A distinguishing characteristic of the system studied is the lack of correspondence between the coefficients D and λ ($\lambda \gg D$)

[SIR Note: D is the crystallization factor determined by Khlopin's formula for conditions corresponding to true thermodynamic equilibrium between the crystals and the solution; λ is the factor from H. Doerner and W. Hoskins' formula corresponding to logarithmic distribution of the microcomponent in the solid phase under conditions when only the surface of the crystals is in equilibrium with the solution].

30. Extraction of Uranium With Tributyl Phosphate From Hydrochloric Acid Solutions

"On the Mechanism of the Extraction of Uranium (VI) With Tributyl Phosphate From Hydrochloric Acid Solutions," by V. B. Shevchenko, I. G. Slepchenko, V. S. Shmidt, and E. A. Nenarokomov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 5, May 60, pp 1095-1099

Analysis of the organic phase and investigation of the dependence of the distribution factor on the composition of the aqueous and organic phases have shown that at concentrations of tributylphosphate (TBP) in the organic phase ranging from 0.040 to 0.734 mols per liter, uranium (VI) is extracted from hydrochloric acid solutions by solutions of TBP in inert solvents principally in the form of the complex $UO_2Cl_2 \cdot 2TBP$.

31. Uranyl Thiosulfate

"On Uranyl Thiosulfate," by A. Ye. Klygin and N. S. Kolyada; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 5, May 60, pp 1170-1171

The solubilities at 25° of uranyl thiosulfate in solutions of sodium thiosulfate of different concentrations were determined. The solubility product of $UO_2S_2O_3$ at 25° was determined and found to be equal to $(3.83 \pm 0.27) \cdot 10^{-4}$. Because the uranyl ion does not form complex anions with thiosulfate, the iodimetric determination of this ion by K. B. Yatsimirskiy and Ye. N. Roslyakova's method is impossible.

32. Separation of Thorium by the Extraction of Thorium Phenylacetate

"Investigation by the Tracer Atom Method of the Possibility of Separating Thorium From Some Elements by the Extraction of Thorium; Part I -- Extraction of Thorium Phenylacetate With Diethyl Ether; The Compound Formed by the Uranyl Ion With Phenylacetic Acid; Separation of Thorium From Uranium," by I. A. Tserkovnitskaya and A. K. Charykov; Leningrad, Radiokhimiya, Vol 2, No 2, Apr 60, pp 222-230

Phenylacetic acid had been proposed as a reagent for the precipitation of thorium in order to separate it from rare-earth elements. Since the thorium phenylacetate precipitate is soluble in some organic solvents, an investigation was carried out for the purpose of determining the feasibility of the separation of thorium from certain elements (primarily

uranium and rare earths) by extraction. The ultimate purpose was that of developing a method for the separation of thorium from naturally occurring materials by the extraction of this element in the form of its phenylacetate.

It was established in the work described that the thorium phenylacetate precipitate can be extracted by organic solvents without an apparent change in its structure, i.e., it is not dissolved in the sense that the energy of solvatation is greater than the energy of hydration. Complete extraction of thorium phenylacetate by diethyl ether takes place in the range of pH = 3-5 at an ionic strength of the solution equal to 2 and fixed at that level by adding ammonium chloride. Thorium can be quantitatively re-extracted from the organic phase with dilute (1:10) inorganic acids. It was found that the constant of the dissociation of phenylacetic acid is equal to $(8.1 \pm 0.4).10^{-5}$ and that the constant of the distribution of phenylacetic acid between diethyl ether and water is equal to 34 ± 2 at 20° and an ionic strength of the solution equal to 2. The existence of a double uranyl-ammonium phenylacetate of the composition $UO_2(C_6H_5CH_2COO)_2 . C_6H_5CH_2COONH_4$ was established. A method has been developed for the separation of thorium from large amount of uranium by extraction of the thorium with diethyl ether in the form of thorium phenylacetate.

33. Some Properties of Thorium Pyrophosphate

"Investigation of the Solubility of Thorium Pyrophosphate in Acids and of Equilibriums Between the Solid Phase and the Solution in the System $Th P_2O_7 - Na_4P_2O_7 - Na_4P_2O_7 - H_2O$ and $Th P_2O_7 - Th(NO_3)_4 - H_2O$," by F. M. Filinov (deceased), Ye. N. Tekster, A. A. Kolpakova, and Ye. Panteleyeva, Chair of Technology of Artificially Produced Radioactive Substances, Leningrad Technological Institute imeni Lensovet; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 5, May 60, pp 1149-1156

The solubilities of thorium pyrophosphate in solutions of hydrochloric, nitric, and sulfuric acid were investigated in the concentration range of 0.1-0.5 N at 20° by using UX_1 as a tracer. By using the same method, the solubilities of sodium pyrophosphate were investigated in the concentration range of 0.02-0.2 mols per liter. The solubility in water of the compound $Na_4[Th(P_2O_7)_2]$ was determined. The electrical conductivity and pH of

aqueous solutions of this compound were also determined. Conductometric titration in the system $Na_4P_2O_7$ - $Th(NO_3)_4$ disclosed that there are distinct and easily reproducible inflections in the conductometric curve at values of the ratio $[P_2O_7^{4-}] / [Th^{4+}]$ amounting to 2; 1; and 0.7-0.8. It was established that the solubility of thorium pyrophosphate in thorium nitrate solutions is greater than its solubility in water.

34. Solvent Extraction of Inorganic Substances

"Characteristics of Heterogeneous Equilibriums Formed in The Extraction of Inorganic Substances," by A. V. Nikolayev, Institute of Inorganic Chemistry, Siberian Branch of the Academy of Sciences USSR; Novosibirsk, Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR, No 4, Apr 60, pp 51-63

General relationships pertaining to the extraction of inorganic substances are considered on the basis of data obtained principally in work with uranium, thorium, and rare-earth elements. Work on the subject done by the author and members of his group is reviewed in some detail. The paper was presented at an October 1959 meeting of the Joint Scientific Council on Chemistry, Siberian Branch of the Academy of Sciences USSR.

35. Physicochemical Properties of Chlorine Trifluoride

"The Physico-Chemical Properties of Chlorine Trifluoride," by Yu. D. Shishkov and A. A. Opalovskiy, Institute of Inorganic Chemistry, Siberian Branch Academy of Sciences USSR; Moscow, Uspekhi Khimii, Vol 29, No 6, Jun 60, pp 761-773

Methods for the preparation of chlorine trifluoride and the physical and chemical properties of this substance are reviewed. The importance of chlorine trifluoride and of halogen fluorides in general in the nuclear energy industry as liquid agents for the conversion of uranium into uranium hexafluoride is emphasized. The experimental production of ClF_3 in Germany in World War II for use as an incendiary substance is briefly referred to. The review is based almost entirely on non-USSR publications. So far as USSR work is concerned, work by N. S. Nikolayev and members of his group (including A. A. Opalovskiy) on the preparation of higher fluorides of transitional elements by employing liquid or gaseous ClF_3 receives some attention. It is stated that the interaction of V_2O_5, WO_3, or MoO_3 with liquid ClF_3 proceeds violently, is accompanied by a flame,

and results in dispersion of the reaction products. Vanadium pentafluoride and the hexafluorides of tungsten and molybdenum are formed. To prepare these fluorides, one should use bromine trifluoride or iodine pentafluoride in preference to chlorine trifluoride because the reaction is less violent then. ClF_3 can be applied more conveniently in the gaseous state. The reaction of gaseous chlorine trifluoride with metallic niobium, tantalum, and molybdenum leads to the formation of NbF_5, TaF_5, and MoF_6, respectively.

36. Vapor Pressure of T_2O

"The Vapor Pressure of T_2O," by M. M. Popov (deceased) and F. I. Tazetdinov; Moscow, Atomnaya Energiya, Vol 8, No 5, May 60, pp 420-424

A method is described for determining vapor pressures of samples of highly concentrated tritium water containing 83.4 and 98.1 mol percent of T_2O. The results obtained in determinations carried out within the temperature range of 12-95° C are reported. To take account of the pressure exerted by gaseous products of the radiolysis of water and of nuclear transformations, the measurements were carried out by a statistical method at two values of the volume of the apparatus. It was found that the boiling points of HTO and T_2O are equal to 100.8 and 101.6° C, respectively. The heats of evaporation at these temperatures are 9.9 kilocalories per mol for HTO and 10.1 kilocalories per mol for T_2O, while the standard entropies ($S^\circ_{298.16}$) of these two compounds are 19.3 and 19.0, respectively.

37. Extraction of Radioactive Isotopes With Esters of Butylphosphinic Acid

"Extraction of a Mixture of Radioactive Isotopes With Esters of Butylphosphinic Acid," by A. V. Nikolayev, S. M. Shubina, and N. M. Sinitsyn; Leningrad, Radiokhimiya, No 1, Feb 60, pp 3-5

Esters of alkylphosphinic acids are efficient extractive agents for uranium and plutonium. L. L. Burger established that the capacity of esters to extract uranium and plutonium increases in the sequence phosphates < phosphonates < phosphinates < phosphine oxides. In this instance, a mixture containing 6% of Ru^{106}, 46% of rare-earth elements, 7% of Zr^{95}, 2% of Cs^{137}, and 15% of Sr^{90} was extracted with butyl esters

of phosphorus acids. It was established that transition from tributyl phosphate to the butyl ester of dibutylphosphinic acid results in increased extraction of radioactive isotopes from nitric acid solutions. Consequently, the reduction of the number of ester groups in a molecule leads to an increase of the distribution factor.

38. Selection of the Complex-Forming Agent for the Ion-Exchange Separation of Rare-Earth Elements

"The Problem of the Effect Exerted by the Size of the Molecules of Complex-Formers and the Temperature on the Ion-Exchange Separation of Radioactive Rare-Earth Elements," by B. K. Preobrazhenskiy, A. V. Kalyamin, and O. M. Lilova; Leningrad, Radiokhimiya, Vol 2, No 2, Apr 60, pp 239-242

The separation factors of all rare-earth elements have been determined when ammonium lactate is used as the complex-former. It was established that there is an optimum size of the molecule of the complex-forming substance at which the selectivity of complex-formation with elements close to each other is greatest; heavy rare-earth elements are best separated with lactate, while light rare-earth elements can be separated most efficiently by using ammonium hydroxyisobutyrate. The effect of the temperature on separation by the ion-exchange method was also investigated. It was established that the temperature has an effect on the selectivity of complex-formation and affects factors of the separation of neighboring elements from each other. This is apparently due to changes in the size of the interacting ions. The investigation described was carried out with Dowex - 50 - X 12.

39. Separation of Rare-Earth Elements by the Fractional Conversion of Their Oxides Into Iodides

"Distribution of Rare-Earth Elements in the Process of the Dissolution in Water of the Products of the Interaction of Their Oxides With Ammonium Iodide," by V. K. Val'tsev and L. K. Solov'yev, Institute of Inorganic Chemistry, Siberian Branch of the Academy of Sciences USSR; Novosibirsk, Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR, No 4, Apr 60, pp 81-86

It was established that by treating a mixture of rare-earth oxides containing 37% of samarium with ammonium iodide and then leaching out the reaction mixture with water, an extracted product containing 56% of samarium can be obtained. The method used is deemed suitable for the fine purification of samarium from therbium, dysprosium, holmium, and erbium.

40. Extraction of Perchloric Acid With Tributyl Phosphate

"Extraction of Perchloric Acid With Tributyl Phosphate," by V. V. Fomin and Ye. P. Mayorova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 5, May 60, pp 1100-1106

The extraction of perchloric acid with solutions of tributylphosphate (TBP) in benzene was investigated. It was established that the extraction is accompanied by the formation of $HClO_4 \cdot 4$ TBP, $2HClO_4 \cdot 4$ TBP and more complex compounds. The velocity constant of the reaction leading to the formation of the first compound listed was determined.

41. Solvates Formed by Zirconium and Hafnium Nitrates With Tributylphosphate

"Tributylphosphate Solvates of Zirconium and Hafnium Nitrates," by G. F. Yegorov, V. V. Fomin, Yu. G. Frolov, and G. A. Yagodin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 5, May 60, pp 1044-1050

It was established that the extent to which nitric acid is taken up by tributylphosphate (TBP) within a wide range of nitric acid concentrations and concentrations of its salts can be estimated by using constants of the reactions of formation of the complex compounds $HNO_3 \cdot$TBP and $HNO_3 \cdot 2$ TBP. It was also established that thereare two solvates of zirconium and hafnium nitrates -- Me $(NO_3)_4 \cdot$TBP and Me $(NO_3)_4 \cdot 2$TBP -- which form at different concentrations of TBP in the organic phase. The dependence of the distribution factors of Zr and Hf on the concentration of hydrogen ions at constant concentrations of free TBP and of the NO_3^- ion was determined.

42. Method for the Production of Hafnium Carbide

"The Problem of the Production of Hafnium Carbide," by G. A. Meyerson and O. Ye. Kreyn; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 5, May 60, pp 1164-1167

The synthesis of hafnium carbide by the interaction of hafnium dioxide with carbon in vacuum was investigated. It was established that a temperature as high as 2,000° is required even in vacuum to eliminate all oxygen from the hafnium dioxide. When a sufficient total quantity of carbon is present in the initial charge, one can obtain at 2200° in vacuum a product close in its composition to Hf C. When there is a

shortage of carbon in the charge, the content of bound carbon in the carbide is lower than the theoretical. However, the sum of Hf + C corresponds to 100%, and the structure of the products obtained corresponds to a Hf C lattice with a reduced period, which indicates that there is a region of homogeneity in the vicinity of Hf C although some carbon atoms in the lattice are lacking. A factor which favors the saturation of hafnium carbide with bound hydrogen is the presence of CO in a quantity corresponding to several millimeters of mercury pressure. A high degree of evacuation results in the formation of carbide which is not saturated with carbon. This is analogous to the results obtained in earlier work on titanium carbide carried out by the authors. Under the condition described, the complete synthesis of hafnium carbide close in composition to Hf C takes place within a relatively short time, viz., one hour.

43. Chromatographic Method for the Purification of Technetium

"A Chromatographic Method for the Purification of Technetium," by A. F. Kuzina and V. I. Spitsyn, Institute of Physical Chemistry, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 5, May 60, pp 1006-1012

A chromatographic method has been developed for purifying technetium concentrates isolated from molybdic acid anhydride that has been irradiated with thermal neutrons. Nitric acid solutions of the technetium are purified chromatographically at pH = 2 by means of the cation-exchange resin KU-2 which is used for adsorbing impurities. By applying chromatographic and radiometric analysis, it was found that the original technetium concentrates contained the radioactive isotopes Zn^{65}, Zr^{95}, W^{181}, and Co^{60}. It was established that by using the chromatographic method, one can efficiently eliminate from technetium concentrates impurities consisting of radioactive and stable elements and isolate chemically and radiochemically pure technetium compounds with yields reaching 90%.

44. Effect of Irradiation With Fast Neutrons on the Properties and Structure of Some Metals and Steels

"Investigation of the Properties and Structure of Some Metals and Steels After Irradiation With Fast Neutrons," by Sh. Ibragimov, V. S. Lyashenko, and A. I. Zav'yalov; Moscow, Atomnaya Energiya, Vol 8, No 5, May 60, pp 413-419

This article discusses the effects of irradiation with fast neutrons and subsequent heat treatment on the properties of some metals. The changes which take place in the properties of metals upon irradiation

are explained by the formation of defects of different types in the crystal lattice. These defects disappear after the metal has been annealed at an appropriate temperature. The kinetics and energy of activation of processes leading to the elimination of defects and strengthening of the materials have been investigated.

[For additional information on nuclear fuels and reactor construction materials, see Radiochemistry.]

Organic Chemistry

45. Improved Yields of Methylethylenediphosphonates Reported

"Diphosphonates. II. Synthesis of Esters of Ethylene- and Methylethylenediphosphonic Acids," by K. A. Petrov, F. L. Maklyayev, and N. K. Bliznyuk; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 5, May 60, pp 1608-1614

A method for obtaining ethylenediphosphonates by reacting sodium dialkylphosphites with dichlorethane was developed by the authors and is described in this report.

An improved method for preparing esters of allylphosphinic and methylethylenediphosphonic acids is also described. Esters of methylenediphosphonic acid were obtained by the addition of dialkylphosphites to allylphosphonates in the presence of sodium alcoholates. This reaction had been studied earlier. However, the authors confirmed that the reaction of dialkylphosphites and allylphosphonates in the presence of alcoholates proceeds very slowly at 90-100°C and speeds up considerably at 130-140°. They also established that the rate of this reaction depends not so much on the temperature as on the quantity of catalyst added. With small quantities of the alcoholate, the reaction does not go on to completion even when the reaction mixture is heated in sealed tubes at 130-140°. With large quantities of the catalyst, the reaction is completed in a short time, and the diphosphonate is obtained in a yield greater than 80%. A. N. Pudovik, in 1952, reported obtaining a 51.6% yield of the same product (Zhurnal Obshchey Khimii, Vol 22, 1952, p 2052).

Esters of allylphosphinic acid were obtained by reacting allyl bromide with sodium dialkylphosphites. By changing the order of adding the reagents to each other and by adjusting the temperature conditions, the authors obtained a yield of 72.5% in contrast to the 57% reported by A. N. Pudovik in 1952.

46. Synthesis of Haloethynesulfochloride

"Investigation of Organic Compounds of Sulfur. V. Synthesis and Some Properties of Haloethynesulfochloride," by B. M. Gladshteyn and L. Z. Soborovskiy; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 5, May 60, pp 1574-1577

A sulfochloride of the acetylene series was synthesized. The general equations showing this synthesis are:

$$C_2H_5MgBr \xrightarrow{HC\equiv CH} \begin{matrix} C\text{-}MgBr \\ \| \\ C\text{-}MgBr \end{matrix} \xrightarrow{SO_2Cl} \left[\begin{matrix} C\text{-}SO\ Cl \\ \| \\ C\text{-}SO\ Cl \end{matrix} \right] \xrightarrow[-SO_2]{H_2O} \begin{matrix} C\text{-}SO_2Cl \\ \| \\ C\text{-}Cl \end{matrix} \cdot H_2O$$

The β-chloroethynesulfochloride in the form of the hydrate was isolated in the form of its hydrate. Its behavior in relation to aqueous ammonia, bromine, chlorine, potassium fluoride, zinc fluoride Ilosway reagent and aniline was investigated.

The dihydrochloride of the phenylamide of β-phenylamino ethyne sulfonic acid ($[C_6H_5NH\text{-}C\equiv C\text{-}SO_2NHC_6H_5] \cdot 2HCl$) was obtained by reacting aniline with β-chloroethynesulfochloride.

47. Preparation of Methylenephosphonates

"Diphosphonates. I. Esters of Methylenediphosphonic Acid," by K. A. Petrov, F. L. Maklyayev, and N. K. Bliznyuk; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 5, May 60, pp 1602-1608

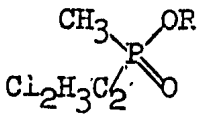
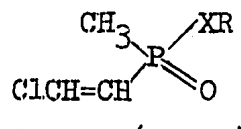
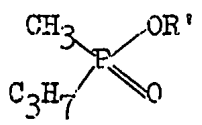
The reaction between sodium dialkylphosphites and esters of chloromethylphosphinic acid was studied in detail by the authors. They demonstrated that the middle esters of methylenediphosphinic, chloromethylphosphinic, and alkylphosphinic acids alkylate sodium dialkylphosphites to form the ester salts of these acids. Improved yields were obtained for a number of known substances. The alkylation reactions indicated appear to be the main cause for the low yields of phosphonates and diphosphonates in the Michaelis-Becker reaction.

Previously unknown diisopropyl and dibutyl esters of chloromethylphosphinic acid were prepared and characterized.

48. Oxidative Chlorophosphination of Vinyl Chloride by Methyldichlorophosphine

"Synthesis of Organophosphorus Compounds From Hydrocarbons and Their Derivatives. XIV. The Oxidative Chlorophosphination of Vinyl Chloride With Methyldichlorophosphine and the Preparation of Some Esters of Dialkylphosphinic Acids," by Yu. M. Zinov'yev and L. Z. Soborovskiy; Moscow, Zhurnal Obshchey Khimii Vol 30, No 5, May 60, pp 1571-1573

Esters of secondary phosphinic acids which contain halogen atoms in an alkyl radical bound to the phosphorus have not been described in the literature up to now. In the present work, the following structural types of alkyl esters of dialkylphosphinic acids containing chlorine were synthesized:

where R= alkyl, R'= CH_2CH_2Cl or $CH(CH_2Cl)_2$, X= O or S.

The authors describe the oxidative chlorophosphination of vinyl chloride with methyldichlorophosphine; the acid chlorides of methyl-dichloroethyl- and methyl-2-chloroethenylphosphinic acids were obtained.

The methyl, ethyl, propyl, isopropyl, butyl, and isobutyl esters of methyldichloroethylphosphinic acid, the ethyl esters of methyl-2-chloroethenylphosphinic acid, the ethyl ester of methyl-2-chloroethenyl-thiolophosphinic acid, and the 2-chloroethyl and 1,3-dichloroisopropyl esters of methylpropylphosphinic acids were synthesized and characterized after separation.

49. Research on Phosphorus Compounds at the Dnepropetrovsk Metallurgical Institute

"Esters of Arylsulfonimidophenylphosphinic Acids," by V. I. Shevchenko and V. T. Stratiyenko, Dnepropetrovsk Metallurgical Institute; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 5, May 60, pp 1561-1565

The authors report the results of a study of the reactions of phenyldichlorophosphazosulfonaryls with sodium alcoholates and phenolates. A number of compounds were synthesized and their physical properties described, including a number of phenyldialkoxyphosphazosulfonaryls ($ArSO_2N{=}P(C_6H_5)(OAlk)_2$), monoalkyl esters of arylfulfonamidophenylphosphinic acids ($ArSO_2NHPO(C_6H_5)(OAlk)$), phenyldiphenoxyphosphazosulfonaryls ($ArSO_2N = P(C_6H_5)(OC_6H_5)_2$), and monophenyl esters of arylsulfonamidophenylphosphinic acids ($ArSO_2NHPO(C_6H_5)(OC_6H_5)$).

50. Synthesis of Acid Chlorides of N-Dichlorophosphinylareniminosulfonic Acids

"Acid Chlorides of N-Dichlorophosphinylareniminosulfonic Acids," by Ye. S. Levchenko and A. V. Kirsanov, Institute of Organic Chemistry, Academy of Sciences, Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 5, May 60, pp 1553-1561

The acid chlorides of N-dichlorophosphinylareniminosulfonic acid were obtained by reacting with PCl_5 the acid dichlorides of arylsulfonamidophosphoric acids having aryl groups which do not contain negative substituents. These acid chlorides posses the chemical properties of the acid chlorides of sulfonic acids and the acid dichlorides of arylsulfonamidophosphoric acids, but, in contrast to the latter, they do not exhibit acid properties.

The aryl esters of N-diaroxyphosphinylareniminosulfonic acids are formed by a reaction of sodium arylates with the acid chlorides of N-dichlorophosphinylareniminosulfonic acids. The latter reaction can be represented by the general equation:

$$ArSO(=NPOCl_2)Cl + 3Ar'ONa \rightarrow ArSO[=NPO(OAr')_2] + 3NaCl.$$

The physical and chemical properties of the synthesized compounds are listed. Three tables accompany the report.

51. Continuation of Research on Organic Compounds of Arsenic Reported

"Some Characteristics of Esters of Dialkylarsinous Acids," by Gil'm Kamay and B. D. Chernokal'skiy, Kazan' Chemico-technological Institute; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 5, May 60, pp 1536-1541

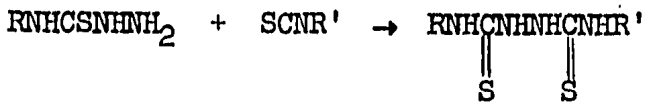
The present work is a continuation of the authors' research in the synthesis and properties of esters of dialkylarsinous acids. Alkyl esters of dialkylarsinic acid were obtained by the oxidation of the corresponding esters of dialkylarsinous acids with selenium dioxide. The first known representatives of the alkyl esters of dialkylarinic acids were prepared; the atomic refraction of arsenic in these compounds was calculated. The physical characteristics of the prepared compounds are listed in two tables.

52. Unsymmetrical Derivatives of 1,6-Diarylhydrazodithiodicarbamides

"Investigation of Unsymmetrical Derivatives of 1,6-diaryl-hydrazodithiodicarbamides. I.," by R. G. Dubenko and P. S. Pel'kis, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 5, May 60, pp 1437-1441

Among the substituted thiocarbanilides, phenylthiosemicarbazides and 1,4-diphenylthiosemicarbazides, there have been found a number of compounds with interesting physiological properties. With this in mind, the authors sought to synthesize and study the various unsymmetrical substituted 1,6-diphenylhydrazodithiodicarbamides with the general formula RNHCSNHNHCSNHR', which are close to the above-mentioned compounds in their properties. Derivatives of this series of compounds have not been investigated extensively. They, apparently, should possess the properties to be oxidized at the hydrazo bond, to react in the thiolo-form, and to form complex compounds with various cations. The compounds are of interest because they can be comparatively easily cyclized into thiourazole derivatives.

Derivatives of 1,6-diarylhydrazodithiocarbamide were prepared by the reaction of 4-phenylthiosemicarbazide with the corresponding substituted phenylisothiocyanates induced by heating in anhydrous alcohol. The reaction takes place according to the equation:



The synthesis, as described in the literature, of several substituted 4-phenylthiosemicarbazides, starting from the corresponding mustard oils and hydrazine hydrate in alcohol, gives low yields and presents difficulties so far as isolation of pure products is concerned. In this work, the derivatives of 4-phenylthiosemicarbazide were obtained from the corresponding substituted phenylisothiocyanates and hydrazine hydrate in an alcohol-water medium.

Substituted phenylisothiocyanates were synthesized from the corresponding amines and thiophosgene in chloroform and water.

In all, the authors synthesized 18 substituted 4-phenylthiosemicarbazides and 39 unsymmetric derivatives of 1,6-diphenylhydrazothiocarbamide which had not previously been described in the literature.

Radiation Chemistry

53. Effect of Gamma-Radiation on Butadiene Elastomers

"Investigation of the Chemical Structure of Butadiene Elastomers Subjected to the Action of Gamma Radiation," by A. I. Yakubchik and V. A. Filatova; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 5, May 60, pp 1177-1182

It was established that butadiene elastomers subjected to the action of gamma radiation lost their solubility, which indicates that there has been cross-linking of macromolecules. The chromatograms of mixtures of acidic products of ozonolysis of irradiated butadiene elastomers of different types (Na-polymerized or polymerized in the presence of a Ziegler catalyst) proved to be identical with respect to the number and type of peaks. However, there were differences in the heights of these peaks. On the basis of the chromatograms which were obtained, one may conclude that in the macromolecules of irradiated elastomers there are sections having the same structure as that of the initial elastomers before irradiation. Reduction in the heights of the peaks made it possible to draw conclusions in regard to the relative extent of the disappearance of double bonds in sections of different structural types.

54. Effect of Gamma-Radiation on the Electrode Characteristics of Lithium Glass

"The Effect of Gamma Radiation on the Electrode Characteristics of Lithium Glass," by N. A. Fedotov; Moscow, Atomnaya Energiya, Vol 8, No 3, Mar 60, pp 262-264

It was established that even after intensive irradiation with gamma-rays, the sensitivity gradient and the resistance of electrodes made of lithium glass remain unchanged. The absolute value of the change of the asymmetry potential of electrodes was found to be approximately 3 millivolts on the average. The results obtained indicate that electrodes made of lithium glass can be used for carrying out reliable determinations of the pH of solutions which have a high content of isotopes that emit gamma-radiation.

55. Angular Energy Distribution of Gamma Radiation Dispersed in Water and Iron

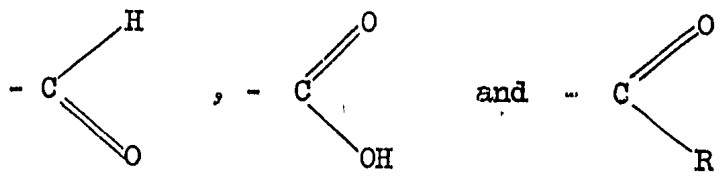
"Angular Energy Distribution of Gamma Radiation Dispersed in Water and Iron," by Yu. A. Kazanskiy; Moscow, Atomnaya Energiya, Vol 8, No 5, May 60, pp 432-440

This investigation deals with the most typical characteristic of the process of multiple dispersion of gamma rays, namely, angular energy distribution, a knowledge of which makes it possible to calculate the reduction of the intensity of gamma radiation under conditions which are complicated from the geometric standpoint. The angular energy distribution in iron and water of gamma rays emitted by a cobalt -60 source have been determined under the assumption that a semi-infinite geometry is valid. It was established that the distributions exhibit a maximum close to the energy value which corresponds to a single dispersion over a minimum angle. It was also established that the angular distributions of intensity vary according to an exponential law and that the exponential factor changes linearly with the atomic number of the medium. The energy distributions of the intensity which have been obtained are compared with the results of calculations carried out by H. Goldstein and J. Wilkins.

56. Effect of Ionizing Radiation on the Chemical Structure of Rubber-Like Fluorine-Containing Polymers

"The Effect of Ionizing Radiation on the Chemical Structure of Rubber-Like Fluorine-Containing Polymers," by A. S. Novikov, V. L. Karpov, F. A. Galil-Ogly, N. A. Slovokhotova, and T. N. Dyumayeva, Physical Chemistry Institute imeni L. Ya. Karpov; Moscow, Vysokomolekulyarnyye Soyedineniya, No 4, Apr 60, pp 485-491

The effect of ionizing radiation on the chemical structure of rubber-like fluorine-containing copolymers has been investigated. The influence of the medium on the process has been elucidated. It has been shown that on irradiation in air, double bonds of the types -CF = CF -, - CH= CF_2, and CF = CF_2 and the oxygen-containing groups



as well as hydroxyl, are formed. On irradiation in vacuum, double bonds of the type -CF = CF_2 appear in large amounts. The number of double bonds in the copolymer and the degree of cross linking have been found to depend upon its hydrogen content.

On the basis of the experimental results, a mechanism is proposed for the formation of double bonds and radicals during irradiation of fluorine-containing copolymers, and the possibilities of the occurrence of degradation and structurization processes are indicated.

57. Grafting of Various Monomers Onto Polyvinylalcohol Films by the Action of X-Radiation

"The Grafting of Various Monomers Onto Polyvinylalcohol Films by the Action of X-Radiation," by I. Santo and K. Gal, Central Chemical Research Institute, Hungarian Academy of Sciences; Moscow, Vysokomolekulyarnyye Soyedineniya, No 4, Apr 60, pp 546-548

The grafting of methylmethacrylate (MMA) onto polyvinylalcohol films (PVA) at low radiation doses ($4 \cdot 10^4$ roentgens) has been investigated. In the case of MMA, the concentration of methyl alcohol used as solvent was found to exert a strong influence on the extent of grafting. An optimal methanol concentration was found at which already low irradiation doses lead to a sharp increase in the extent of grafting.

/For additional information on radiation chemistry, see Nuclear Fuels and Reactor Construction Materials./

58. Complexes Formed by Yttrium

"Investigation of Complexes Formed by Yttrium; Part I- Yttrium Oxinates," by M. G. Panova, V. I. Levin, and N. Ye. B. Berezhneva; Leningrad, Radiokhimiya, Vol 2, No 2, Apr 60, pp 197-207

The extraction of yttrium by a solution of 8-hydroxyquinoline (oxine) in chloroform from a 3-M perchlorate solution was investigated. A method has been developed for determining the distribution factors in such a manner that the effect of hydrolysis on the results of the determination is eliminated. At concentrations of yttrium in the aqueous phase lower than or equal to 10^{-6} M, this element is extracted in the form of the simple oxinate YA_3. At higher concentrations, the dimer $(YA_3)_2$ is extracted predominantly. On the average, 0.5 molecule of undissociated 8-hydroxyquinoline enters into the composition of the complex being extracted. By employing extraction methods, the association constants of the 8-hydroxyquinoline complexes of yttrium were determined. They were found to correspond to

$$\log \chi_1 = 8.15 \pm 0.14;\ \log \chi_2 = 14.90 \pm 0.25;\ \log \chi_3 = 20.25 \pm 0.35$$

Three different methods of calculating the association constants were compared. It was established that the "two parameter" graphic method gives the best results, which are close to those obtained by the method of the least squares. The graphic method is of advantage because of its simplicity and the short time required for applying it.

59. Some Complexes Formed by Yttrium

"Investigation of Complexes Formed by Yttrium; Part 2- Sulfate, Nitrate, and Chloride Complexes," by M. G. Panova, N. Ye. Brezheneva, and V. I. Levin; Leningrad, Radiokhimiya, Vol 2, No 2, Apr 60, pp 208-214

A method has been developed for the quantitative investigation of the formation of complexes in solution that is based on changes in the equilibrium distribution of a substance between two liquid phases as a result of the formation of a complex. A method has been developed for the calculation of constants of complex-formation, which constitutes a new variant of the "two parameter" method. The constants of the formation of yttrium complexes with sulfate, chloride, and nitrate ions have been determined at a constant ionic strength amounting to 3.0.

60. Electrochemical Behavior of Europium at a Mercury Cathode

"Separation of Radioactive Isotopes at a Mercury Cathode; Part I - Investigation of the Electrochemical Behavior of Europium," by V. P. Shvedov and Fu I - Pei; Leningrad, Radiokhimiya, Vol 2, No 1, Feb 60, pp 57-64

On the basis of the results described, it is concluded that the free ions of europium, on forming because of the dissociation of the complex in which they are contained, displace the alkali metal in the mercury amalgam originally formed with the formation of an amalgam of the rare earth element. The effects of different factors on the separation of europium at the mercury cathode were investigated, including the influence exerted by the concentration of the complex-forming agent. It was established that, not only citric acid, but also succinic acid, tartaric acid, and trilon B can be used as complex-forming agents in the electrolytic separation of europium.

$Eu^{152-154}$ and Cs^{137} were used in the investigation described.

61. Determination of Radioactive Strontium in Water

"Determination of Radioactive Strontium in the Water of Open Reservoirs [Bodies of Water]," by V. L. Zolotavin and L. K. Ponomareva; Leningrad, Radiokhimiya, Vol 2, No 1, Feb 60, pp 104-106

A new method is proposed for the determination of strontium-90 and strontium-89 in water when these isotopes are present in small concentrations. The sodium salt of rhodizonic acid is used for the precipitation of the strontium. The time required for the determination is 1.52 hours, and the maximum error is $\pm 10\%$. Application of the method described makes it possible to determine activity due to strontium-90 down to a strontium content of 5×10^{-11} curies per liter, which is by one order smaller than the smallest permissible concentration of this isotope in water. The presence of cesium-137, ruthenium-106, cerium-144, and zirconium-95 does not interfere with the determination.

62. Radiochemical Investigation of the Products of Splitting of Uranium With Protons Having an Energy of 660 Mev

"Radiochemical Investigation of Products of the Splitting of Uranium With Protons Having an Energy of 660 Mev," by A. K. Lavrukhina and S. S. Rodin; Leningrad, Radiokhimiya, Vol 2, No 1, Feb 60, pp 83-93

By carrying out a radiochemical investigation of the products of splitting of uranium with protons having an energy of 660 Mev and using experimental and interpolated data, the whole complex of the formation of residual nuclear products has been clarified. The fundamental relationships underlying the formation of these products have been established. It was found that the full cross-section of the splitting of uranium equals 0.4×10^{-24} cm^2 and that there is a relatively high yield of isotopes possessing an excess of neutrons. It could be shown that the isotopes which are formed with the greatest yields are closest to the line of nuclear stability. The magnitude of the ratio $\Sigma \eta / \Sigma \rho = 2.3$ indicates that a considerable number of protons is emitted during the splitting of uranium. This phenomenon can be explained by the contribution to the number of protons resulting from the fission of nuclear products and also to the higher cross-section of fragmentation exhibited by uranium as compared with other elements. The effect of the fission process on the yield of products of the splitting of uranium is discussed.

63. Determination of Radioactive Impurities in Germanium-71

"Determination of Radioactive Impurities in Germanium-71 Preparations and Preparation of Radiochemically Pure Germanium-71," by M. M. Golutvina and Ye. A. Tikhomirova; Leningrad, Radiokhimiya, Vol 2, No 1, Fed 60, pp 112-119

Ge^{71} is produced continuously by irradiating metallic germanium in a nuclear reactor. It was established that germanium-71 which is produced in this manner and derivatives of this isotope which are distributed contain selenium-75, antimony -124, thulium -170, and cesium - 134 as impurities. The proportion of these impurities varies. A simple and rapid method has been developed for the purification of germanium by an extraction method. Application of the procedure described results in the isolation of radiochemically pure Ge^{71}.

64. New Soviet Chemistry Journal on Kinetics and Catalysis

Moscow, Kinetika i Kataliz, Vol 1, No 1, May/Jun 60

The first issue of the new journal Kinetika i Katiliz (Kinetics and Catalysis), published by the Academy of Sciences USSR, contains 175 pages, has table of contents in Russian and English, and has a distribution of 1,200 copies. It includes 16 technical articles, a two-page editor's preface, and a six-page khronika (news) section. Each technical article begins with a Russian abstract and carries the author's institutional affiliation ahead of the bibliography at the end.

The editor's preface to this first issue notes the importance of establishing scientific foundations for the control of chemical conversions as a leading problem in fulfilling the 1959-1965 plan provisions for 100-billion-ruble development of the chemical industry and the role of research and development aimed at discovery of regularities (laws) governing the mechanism and kinetics of chemical reactions and methods of regulating their direction and rate in this problem. It says, further, that the significance of the laws of chemical kinetics and catalysis is not limited to the chemical industry, but bears as well on power engineering, metallurgy, petroleum refining, and other national economic areas; and their role is exceptionally great in biological science, where selective catalytic action of enzymes is the basic method of controlling the most important functions of living organisms.

The extensive and rapid development of work in the field is pointed out. The Siberian Branch of the Academy of Sciences USSR is mentioned especially, "where the first Institute of Kinetics and Combustion and Institute of Catalysis in our country are being established."

The journal is to serve as a vehicle for original theoretical and experimental works on the kinetics of chemical conversions in the gas, liquid, and solid phases, investigation of intermediate active particles (radicals, ions), combustion, homogeneous and heterogeneous catalysis, catalyst selection criteria, structure of catalysts, catalytic processes of practical importance, the influence of mass and heat transfer on the kinetics of chemical conversion, and methods of calculating and modeling chemical reactors. Serious attention will be devoted to elucidation of methods of investigating the mechanism and kinetics of chemical reactions and the structure and properties of catalysts. The work of leading foreign (i.e., non-Russian) scientists, as well as Soviet work, will be presented. Letters, bibliographies, conference coverage, reviews, etc. will also be carried.

This is one of a series of six new publications listed as "Journals of the Siberian Branch of the Academy of Sciences USSR." Though this first issue is dated May/June 1960, it is advertised as a quarterly.

65. Forthcoming Conference on Physicochemical Analysis

"Announcement" unsigned; Moscow, Zhurnal Neorganicheskoy Khimii, Vol V, No 5, May 60, back cover

"The 6th of December 1960 marks the 100th year since the birth of the outstanding chemist -- the founder of physicochemical analysis -- Academician Nikolay Semenovich Kurnakov.

"This date is timed with the calling of the Fourth All-Union Conference on Physicochemical Analysis in Moscow.

"Work of the conference will be conducted in plenary sessions and the following sections:

1. General problems of physicochemical analysis.
2. Solutions and salts.
3. Metallic alloys and semiconductors.
4. Silicates and inorganic polymers.
5. Organic systems.
6. Physicochemical analysis in analytical chemistry.

"The address of the organizational committee is:

Moscow V-71, Leninskiy Prospekt, 31, Institut Obshchey i Neorganicheskoy Khimii imeni N. S. Kurnakova Akademii Nauk SSSR."

66. Forthcoming Conference on Deep-Seated Processes

Untitled, unsigned announcement; Moscow, Geokhimiya, No 4, 1960, p 380

"The Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy of the Academy of Sciences USSR, together with other organizations, is planning to hold a conference in the second half of November 1960 on problems of experimental research in the field of deep-seated processes.

"The conference is being conducted for the purpose of explaining the general nature of experimental research at high temperatures and pressures directed at the solution of geochemical problems, for an exchange of experience, and for coordination of research and the working out of the necessary organizational and technical measures for achieving further development in this field of research.

"It is planned to hear and discuss material on the following sections:

1. Information from individual organizations on the status of work in experimental research at high temperatures and pressures and on plans for future work.

2. Scientific reports on the problem (theoretical and experimental).

3. Experimental technique and material-technical provisions (instruments, equipment, and materials).

"It is intended to issue printed abstracts of reports prior to the conference and to publish a special collection after the conference."

The article is signed by the Conference Organizational Bureau at the following address: Moskva V-133, Vorob'yevskoye shosse 47-a, GYeOKhI AN SSSR, Orgbyuro Soveshchaniya po glubinnym protsessam.

III. ELECTRONICS

Communications

67. Corrections in Current Distribution of Antenna Reflector

"Distribution of Currents on the Reflector of a Mirror Antenna," by L. B. Tarmakovskiy and V. L. Tandim; Moscow, Radiotekhnika i Elektronika, Vol V, No 6, Jun 60, pp 918-925

"Diffraction corrections in the current distribution on an idealized reflector of a mirror antenna are studied. A relationship is established between currents induced on the reflector by the near field of the radiator and the radiation pattern of the radiator. The insignificance of correction for curvature of the reflector for a second order surface with the source at the focus is shown. Formulas are derived for the fringe current of the circumference which describes the effect of a sharp reflector rim in relation to the geometry of the reflector."

68. Noise-Stability of Two Decoding Methods Compared

"A Comparison of Two Methods of Decoding Interval Codes," by L. P. Kuklev and Yu. P. Ozerskiy; Moscow, Radiotekhnika i Elektronika, Vol V, No 6, Jun 60, pp 894-901

A comparison is made of the noise-stability of two methods of decoding, the coincidence method and the summing method. The comparison is made in relation to fluctuating noise for cases of controlled and fluctuating signals, and the error of decoding at a given signal-to-noise ratio at the detector input is determined for both methods.

It is concluded that, where the decoding error must be small, the coincidence method is more advantageous than the summing method, and only for comparatively small signal-to-noise ratios does the summing method show a certain advantage.

The author expresses his thanks to Ye. I. Manayev for his assistance.

69. Smearing in Television Image of Moving Object

"On the Resolution and Definition of the Television Images of Moving Objects," by K. M. Shul'zhenko, Izvest. Tomskogo politekhn. in-ta (News of the Tomsk Polytechnic Institute), No 86, 1958, pp 123-136 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 6.7436)

This article discusses the smearing of the images of moving objects produced by storage-type television transmitting tubes. The idea is introduced of a zone of displacement "a" of the moving details of the image for an equivalent exposure time. It is shown that estimates of the variation of sharpness in relation to maximum transconductance and the duration of the wave front coincide. A supericonoscope was used in the experiments. The travel of the black-white transition along the scan line was repeated with the frame frequency. On the oscilloscope screen, the line signal with an image having moving borders was observed, and the transient characteristic of the system during transmission of moving objects was determined. The theoretical results were confirmed by experiment. The lack of definition [smearing factor] was found to be

$$H_p = \sqrt{a^2 + \sum_{i=1}^{i=n} H_i},$$

where H_i is the smearing caused by the objective, aperture opening, and the transient characteristics of various transmission links.

Components

70. Adaptability of DATs-50 Arc Lamp for Signaling

"Frequency Response of the DATs-50 Point-Arc Lamp," by V. A. Parshinskiy; Moscow, Svetotkhnika, No 7, Jul 60, pp 11-13

The frequency response of the DATs-50 point-arc lamp was studied to determine its suitability in transmission of information to a great distance by the modulated light beam. The light intensity of the DATs-50 lamp is $2 - 3 \times 10^7$ nit, and the diameter of its light spot is about one mm.

The main component of the lamp is a specially processed tungsten cathode tube filled with zirconium oxide. The glass bulb is filled with argon at a pressure of one atm. The operating voltage at the lamp is 16 v, and the firing voltage is from 1,000 to 2,000 v. The electric modulation of the DATs-50 lamp is accomplished by superposition of ac current from a sonic-frequency oscillator on the lamp's dc current supply. The maximum practical modulation frequency of the lamp is 10,000 cps, and the minimum about 100 cps.

It was shown that the DATs-50 arc lamp is quite suitable for information transmission by modulated light beam.

71. Vavilov-Cherenkov /Čerenkov/ Effect in Anisotropic Wave Guides

"Peculiarities of the Vavilov-Cherenkov Effect in Anisotropic Wave Guides," by N. A. Khizhnyak and V. P. Shestopalov, Uch. zap. Khar'kovsk. un-t, 1959, 102, Tr. Radiofiz. fak. (Scientific Reports of Khar'kov University, 1959, Vol 102, Works of the Radiophysics Faculty), No 3, pp 69-74 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 6.7166)

The power losses are considered for particles which move uniformly along the axis of a rectangular wave guide filled with a homogeneous anisotropic dielectric having a diagonal tensor of dielectric permeability. Expressions are obtained for the radiation field, and it is shown that, contrary to the case of the motion of particles in an infinite medium, the fields of the ordinary-wave component and the extraordinary-wave component are associated through the boundary conditions produced by an oscillatory system similar to a resonant pendulum. Because of the coherence of the ordinary and extraordinary wave components, pulsations are produced. It is possible to obtain pulsations corresponding to any submillimeter-wave range.

72. H_{20} Waves in Cruciform Wave Guide

"Calculation of the Critical Frequency for H_{20} Waves in Wave Guides Having a Cruciform Cross Section," by V. M. Sedykh, Uch. zap. Khar'kovsk. un-t, 1959, 102, Tr. Radiofiz. fak. (Scientific Reports of Khar'kov University, 1959, Vol 102, Works of the Radiophysics Faculty), No 3, pp 63-68 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 6.7171)

An equation is obtained which relates the cross sectional dimensions of the wave guide to a natural number in the form of an infinite matrix. The divergence of the critical frequency values (computed in the first approximation and measured experimentally) does not exceed 1.4 percent.

73. Elliptically Polarized Waves in Circular Wave Guide

"The Ponderomotor Effect of an Elliptically Polarized Electromagnetic Wave on the 'Plane' Phase-Shifting Element in a Circular Wave Guide," by M. A. Silayev, Uch. zap. Khar'kovsk. un-t, 1959, 102, Tr. Radiofiz. fak. (Scientific Reports of Khar'kov University, 1959, Vol 102, Works of the Radiophysics Faculty), No 3, pp 25-33 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 6.7172

This report considers the polarization transformation by a "plane" phase-shifting element during the transmission of a wave with arbitrary orientation of the polarized ellipse. The average power transmitted during one period by an elliptically polarized H_{11}-wave is determined. On the basis of a quantum-mechanical notion, the angular electromagnetic moment of the H_{11}-wave is established. The ponderomotor moment of the elliptically polarized H_{11}-wave is also determined.

74. Field Effects on a Conductor Inside a Wave Guide

"Effect of Electromagnetic Waves On a Conducting Body Inside a Wave Guide," by M. A. Savchenko; Uch. zap. Khar'kovsk. un-t, 1959, 102, Tr. Radiofiz. fak. (Scientific Reports of Khar'kov University, 1959, Vol 102, Works of the Radiophysics Faculty), No 3, pp 43-47 (from Referativnyy Znurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 6.7199)

An analysis was made of the mechanical effects of the electromagnetic field on a metallic body inserted inside a wave guide. Results are given of the solution of the problem for a loop, a dipole, and a system of dipoles. It is shown that, discounting mutual effects, the change of the mean moment of rotation of a system of dipoles is not proportional to the number of dipoles in the system.

75. Influence of Auto-Oscillations in Potentiometer Bridge Computing Devices

"On the Influence of Auto-Oscillations on the Precision of Bridge-Type Computing Devices," by V. I. Sergeyev, Trudy Instituta Mashinovedeniya AN SSSR, Seminar po Tochnosti v Mashinostroyeniya i Priborostroyeniya (Works of the Institute of Machine Science, Academy of Sciences USSR, Seminar on Precision in Machine Building and Instrument Building), No 12, 1959, pp 58-71 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 4.7385)

A study is made of the auto-oscillations in a rheostat bridge circuit with automatic drive, designed for the multiplication of two values. The auto-oscillations are the result of such nonlinearities of the drive as a

zone of insensitivity, a zone of saturation, and dry friction. Formulas are derived with which it is possible to compute the probability characteristics (mathematically expected and mean square deviations) of the amplitude values of the auto-oscillations. The total displacement error of the bridge circuit is obtained as the sum of the amplitude values of the auto-oscillations and a number of initial errors in the given potentiometers.

Instruments and Equipment

76. Brownian Movement and Wattmeter Sensitivity

"On the Lower Limit of Power Measured by a Ponderomotor Wattmeter," by V. D. Kukush and V. G. Orlov, Uch. zap. Khar'kovsk. un-t, 1959, 102, Tr. Radiofiz. fak. (Scientific Reports of Khar'kov University, 1959, Vol 102, Works of the Radiophysics Faculty), No 3, pp 59-62 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 6.7044)

The notion was confirmed that the sensitivity threshold is limited by the fluctuations of the instrument pointers resulting from thermal (Brownian) movement. A formula is given for determining the measurement error resulting from Brownian movement. The error value cannot be reduced by amplifying the small deflections of the sensing element, nor by evacuating the instrument. A formula is given for determining the lower limit of power measured with a specified precision.

77. Wave Guide Meter for High Power Measurements

"On the Problem of Measuring High Power Levels," by Ye. G. Bilyk, and R. A. Valitov, Uch. zap. Khar'kovsk. un-t, 1959, 102, Tr. Radiofiz. fak. (Scientific Reports of Khar'kov University, 1959, Vol 102, Works of the Radiophysics Faculty), No 3, pp 35-41 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 6.7045)

An investigation is made of the problem of measuring high and superhigh levels of very high frequency power by the ponderomotor method utilizing the mechanical force of the magnetic field acting on a membrane in the wall of a wave guide. Diagrams are given of pressures generated at the walls of a rectangular wave guide for various types of waves. A table shows comparative pressures for the 3-centimeter and 10-centimeter (x and s) bands. The question of shortening the length of the waves in the wave guide (slowing the propagation) is considered as a method of increasing the sensitivity of the instrument. Two methods of constructing the delay system are

discussed: the insertion of a dielectric into the wave guide and designing the walls of the wave guide as a comb-structure. A description is given of a design for a ponderomotor measuring device using a delay system in the 3-centimeter band. A capacitance-type transducer is used to convert the pressures into electrical values (current or voltage).

78. Radio Buoy for Sea Wave Measurements

"Measuring the Waves in Deep Water by Means of a Radio Wave-Graph," by A. K. Kuklin, Trudy Vostochno-Sibirskogo Filiala AN SSSR, (Works of the Eastern Siberian Branch of the Academy of Sciences USSR), No 15, 1958, pp 27-37 (from Referativnyy Zhurnal--Elektrotekhnika, No 8, 25 Apr 60, Abstract No 4.7303)

The "radio wave-graph" determines the height, period, and rate of motion of waves, as well as the wind velocity, the velocity and direction of drift of the buoy containing the transducers for the measured values. The transmitting section, consisting of the decimeter-wave transmitter, transducers, electromagnetic manipulator, commutator, and timing relay, is located in the buoy. The radio receiving and recording sections, which are made up of an AM-signal receiver, frequency filter, high-frequency detector, electromagnetic relay, recording device, two pulse counters and magnetic-tape recorder, can be as much as 32 kilometers apart. The device can operate for about 10 days without a change of power supply /batteries/.

79. New Soviet Aviation Instrument

"Aircraft Control Equipment" (unsigned news item); Prague, Obrance Vlasti, 17 Jun 60, p 5

According to a brief report, a group of Soviet engineers has designed a special electronic control unit which is scheduled to be installed on all Soviet aircraft in the future. The small instrument, weighing only a few kilograms, is to be installed in the immediate vicinity of the tail assembly and will record, fully automatically, the functioning of all important flight instruments. Furthermore, it will have the capacity of recording the conversations of the crew over a period of several hours. In the event of a disaster, it would then be possible to determine the exact causes of any malfunctions according to the special instrument package.

Materials

80. Recent Progress in Semiconductors

"Speech Given at the Plenary Session of the Central Committee CPSU, 14 July 1960 in Connection With Reports on the Execution of Decisions of the 21st Congress CPSU Concerning the Development of Industry, Transportation, and Introduction of the Newest Achievements of Science and Technology," by Academician A. F. Ioffe, Director of the Institute of Semiconductors, Academy of Sciences USSR; Moscow, Ekonomicheskaya Gazeta, No 39 (711), 15 Jul 60, p 4

"Only 30 years ago, semiconductors began to be used in technology, initially as rectifiers of alternating currents and materials for photocells. Since then, they have been introduced extensively into radio engineering, automatics and signal transmission, and measurement techniques, and, during recent years, into television, electronic computer applications, the generation of power, and refrigeration.

"The time is not far away when semiconductor thermoelements and photocells will be instrumental in rebuilding the basis of our power industry and of refrigeration and heating technology as well. They will also change the ratio of direct to alternating current used in electrical engineering.

"The best-known applications are in radio engineering and rectifiers. There is no denying that we still lag to some extent in this field, although considerable progress has been made in scientific research and production.

"The fact that semiconductor diodes and triodes have replaced radio tubes is sufficiently well-known. Everybody knows that the new semiconductor devices consume many times less electric power, that they do not require preheating as vacuum tubes do, that they can be manufactured in very small sizes, that they are not affected by vibrations, that they are distinguished by an exceptional mechanical strength and a long useful life, and that their application improves computers.

"Rectifiers of alternating current, the application of which 10 years ago, when cuprous oxide and selenium were used, entailed power losses close to 30%, do not produce a power loss of more than 1-2% now that germanium and silicon are used. Application of modern rectifiers solves problems arising in the production of aluminum and other metals, in electrical transportation, and in many other fields where direct current is applied.

"The third field of the application of semiconductors, namely, photocells, has become widely known because of the application of such cells on satellites and space craft where radiation emitted by the sun becomes the sole and unalterable source of power. The possibility of an economic production of electric power by converting the energy of solar radiation with the aid of semiconductor thermoelements is not too far removed; this will introduce new factors into all aspects of power production.

"Because of the exceptional importance of the problem of power generation, somewhat more detailed information on thermoelements is appropriate. The temperature of the heat source is of decisive importance in the operation of thermoelements. If the temperature does not exceed 300-400° C, solid semiconductor thermoelements employing bismuth telluride or lead telluride have an efficiency of up to 8%. At the temperature of 700°, an efficiency of 12-15% can apparently be reached.

"An efficiency in the range of 8-15% is already of great interest in itself, specifically so far as production of electric power by the conversion of solar radiation energy and applications in agriculture are concerned. Moreover, still more concrete possibilities arise immediately within the period corresponding to the current 7-year plan.

"Thermal power generators, which are still in the stage of development, will be transferred from physical laboratories to technical applications within the following few years. However, the same thermoelements can already be applied now on a large scale as refrigerating devices, heaters, and thermostats. They are capable of bringing about a temperature drop amounting to 80°.

"Present-day refrigeration technology employs either compressors or the effect produced by the distillation of fluids. If thermoelements are used, the same result can be achieved by simply passing a current through them. It is entirely feasible to use thermoelements for cooling buildings in the summer and heating them in the winter and also for regulating the temperature.

"No reference has been made to semiconductors which focus magnetic and electric fields (ferrites and seignettoelectrics), measuring devices, nonlinear technique, voltage regulators, and many other applications which are characteristic for the present-day stage of technological development and which would have been impossible without semiconductors.

"We are only now beginning the investigation of liquid and gaseous semiconductors and are only now entering the range of high temperatures. In connection with this, there are possibilities for further progress."

81. Measurement of Changes in the Flux of Fast Neutrons in the Reactor Core by Determining Changes in the Conductivity of Germanium

"Measurements of Fast-Neutron Flux Distribution in the Core of the VVR-S Reactor by Determining Conductivity Changes in Germanium," by E. Aleksandrowicz and M. Bartenbach, Institute of Nuclear Research of the Polish Academy of Sciences (Warsaw); Moscow, Atomnaya Energiya, Vol 8, No 5, May 60, pp 451-452

In connection with work done at the Institute of Nuclear Research in Warsaw on the behavior of semiconductors under the action of neutron radiation, the necessity arose of determining the distribution of the flux of fast neutrons in the core of the reactor. This was done by measuring changes in the conductivity of single crystals of germanium of the N-type. Under the conditions involved, the conductivity of germanium of the N-type gradually decreases, and the germanium in the final stage changes into a semiconductor of the P-type.

82. Experiments With Controlled Semiconductor Resistors

"Controlled Nonlinear Semiconductor Resistors (UNPS)," by O. M. Kudryavtsev and V. I. Pruzhinina; Moscow, Radiotekhnika i Elektronika, Vol V, No 6, Jun 60, pp 1006-1007

By using the principle of parameter control of nonlinear semiconductor resistors, it was found possible to create a number of simple and reliable functional-converter circuits, such as phase discriminators, modulators, voltage stabilizers, automatic gain controls, etc.

Due to its polycrystalline structure, a change in conductivity in the material of a nonlinear semiconductor resistor is observed, not only in the plane of the applied electrical field, but also in any other direction. These properties are relatively stable in a temperature range of -60 to +150°C and a frequency range of up to 15-20 kc.

In the example given, a controlling voltage is applied to the electrodes in one plane and the controlled voltage to the electrodes in a perpendicular plane. The specific conductivity depends on both voltages, and the volume resistivity of the sample is a function of the two mutually perpendicular electrical fields.

Results of measurements of one such sample, with the controlled voltage maintained constant, are given in a table.

83. Pulse Properties of Transistors

"Pulse Properties of Junction Transistors," by I. K. Tregub, Tr. Sektsii poluprovodnik. priborov. Ukr. resp. pravl. Nauchno-tekhn. o-va radiotekhn. i elektrosvyazi (Works of the Section on Semiconductor Devices. Ukrainian Republic Administration of the Scientific-Technical Society of Radio Engineering and Electrical Communications), No 1, 1958, pp 74-82 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 5.4302)

A study was made of the quasistationary pulse characteristics of junction transistors in large-signal regimes. A circuit was devised for plotting the characteristics in a system having a configuration with a common emitter. Results are given of measurements for the P2B-type triode during a variation of base current from zero to 700 milliamperes. The pulse repetition rate of the input current was 700 cycles per second; and the pulse duration, 30 microseconds. A graph shows the relationships of output impedance and amplification factor to current.

It was established that, in a heavy-current regime, the collector resistance reaches a value on the order of one kilohm; the short-circuit current gain drops to negative values; the input impedance drops to one ohm, and the rate of the transient processes increases.

84. Hall Effect and Transverse Reluctance in Germanium

"Hall Effect and Transverse Reluctance Studies in Germanium in a Field Up to 400 Kiloersted," by V. R. Karasik, Moscow State University; Moscow, Doklady Akademii Nauk SSSR, Vol 130, No 3, 21 Jan 60, pp 521-522

The strong magnetic fields were produced with an instrument described in an earlier article by the author (Pribory i Tekhn. Eksperimenta, No 1, 1959, p 142). The specimens studied were single crystals of germanium rotated on the /111/ axis. The specific resistance of the n-type specimens, alloyed with antimony, was established at 3 ohm/cm at room temperature for a diffusion length of 0.7 mm. The p-type specimens had a nearly normal conductivity at a diffusion length of 1.7 mm. In the reluctance investigations, it was established that the geometry of the specimens and the surface condition have no influence on the measurement. For all the specimens, the dependence of Hall emf on the magnetic field was linear. The results obtained in the study of the transverse reluctance are not in keeping with existing theories.

85. Investigation of the Dielectric Losses and Polarization of Stereoregular Polymethylmethacrylate

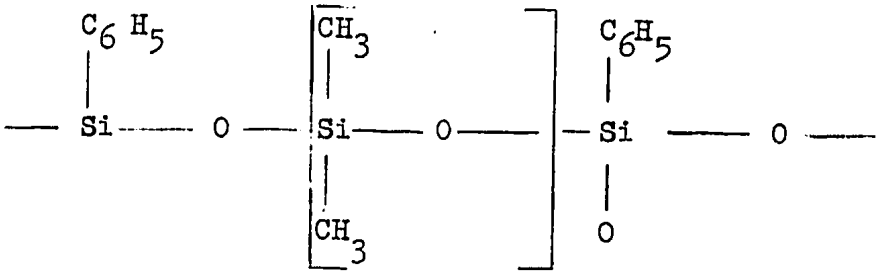
"Investigation of the Dielectric Losses and Polarization of Stereoregular Polymethylmethacrylate," by G. P. Mikhaylov and T. I. Borisova, Institute of High-Molecular Compounds, Academy of Sciences USSR; Moscow, Vysokomolekulyarnyye Soyedineniya, No 4, Apr 60, pp 619-625

The temperature-frequency relationships of the dielectric losses and dielectric constant of syndiotactic and isotactic polymethylmethacrylate (PMMA) have been investigated. The dielectric properties of the syndiotactic specimens have been found to be the same as those of the atactic polymers. Entirely different are the relationships exhibited by isotactic PMMA for the dipole losses of both types. The effective dipole moments calculated from data on the reduced dielectric constants are in complete agreement with the character of the changes in the dielectric losses.

86. Polydimethylpolyphenylsiloxanes

"Polydimethylpolyphenylsiloxanes," K. A. Andianov and Sun Shu-meng, All-Union Electrical Engineering (Elektrotekhnicheskiy) Institute; Moscow, Vysokomolekulyarnyye Soyedineniya, No 4, Apr 60, pp 554-557

On condensation of polydimethylethoxysilanes with phenyltrichlorosilane, polydimethylpolyphenylsiloxanes of the general formula



with varying distances between the trifunctional groups in the principal chain of the molecule have been obtained.

The properties of the polymers have been investigated, and it has been found that with increasing distance between the trifunctional phenylsiloxane groups in the principal chain, the thermal stability of the molecules diminishes.

87. Investigation of the Polycondensation of Polyethyleneterephthalate and Polyorganoethoxysiloxanes

"Investigation of the Polycondensation of Polyethyleneterephthalate and Polyorganoethoxysiloxanes," K. A. Andrianov, O. I. Gribanova, A. G. Prelkova, N. N. Sokolov, and Sun Shu-meng, All-Union Electrical Engineering (Elektrotekhnicheskiy) Institute; Moscow Vysokomolekulyarnyye Soyedineniya, No 4, Apr 60, pp 521-525

The polycondensation of polyethyleneterephthalate with polymethylphenylethoxysiloxanes has been investigated. It has been found that this reaction leads to polymers with satisfactory mechanical and dielectric properties. A study of the thermal stability of a polymer that has been prepared showed this stability to be on a high level.

/For additional information on electronic materials, see Chemistry, Industrial and Radiation./

Wave Propagation and Antennas

88. Theoretical Calculation of Three Wave Guide Radiators

"Investigation of Wave Guide Radiators Excited by a Relativistic Electron Beam in the Millimeter Band," by Yu. V. Anisimova, G. A. Bernashevskiy, A. N. Vystavkin, and L. G. Lomize; Moscow, Radiotekhnika i Elektronika, Vol V, No 6, Jun 1960, pp 969-980

A theoretical calculation is made of various wave guide radiators using relativistic bunched electron beams, and an attempt is made to narrow the discrepancies which presently exist between theoretical calculations and experimental results.

Radiation is computed in a smooth wave guide of finite length with a rectilinear electron beam, a wave guide filled with a dielectric (Cherenkov radiator), and a magnetic undulator. A linear accelerator, designed by G. I. Zhileyko, served as the source of the bunched electron beam and operated in the 10 cm band with an output energy of 0.5 to 5 Mev. The radiation spectrum consisted of individual lines at frequencies which were multiples of the bunching frequency of the beam. Radiation power reached 10-100 milliwatts on the 10th to 12th harmonics (with a wave length of 8-10 millimeters), and, by shortening the wave length from 10 to 2 millimeters, power decreased at an average rate of approximately one db for a change to each successive harmonic.

89. Suspended Antenna Device For Measuring Transient Power

"The Utilization of a Ponderomotor Force to Measure Transient Power During the Generation of Electromagnetic Energy," by R. A. Valitov and P. A. Aleksandrov, Uch. zap. Khar'kovsk. un-t, 1959, 102, Tr. Radiofiz. fak. (Scientific Reports of Khar'kov University, 1959, Vol 102, Works of the Radiophysics Faculty), No 3, pp 49-50 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 6.7198)

A description is given of a method of utilizing the ponderomotor force of a transmitting antenna to measure output power in the very high frequency range. The power meter incorporates an antenna suspended in free space by a quartz fibre and connected to the primary wave guide by means of a loop. The rotation of the antenna caused by electromagnetic energy is established by means of an optical indicator. The arrangement provides a linear dependence of the angle of rotation of the antenna on the value of the transient power. The coupling value between the antenna and the feed line and the reactance introduced by the coupling element remain unchanged during the rotation of the antenna. The frequency range of the device is determined by the bandwidth of the antenna system plus its matching elements.

90. Possibilities of Using Ponderomotor Forces in VHF Engineering

"The Ponderomotor Forces of Electromagnetic Waves and the Possibilities of Using Them," by R. A. Valitov, Uch. zap. Khar'kovsk. un-t, 1959, 102, Tr. Radiofiz. fak. (Scientific Reports of Khar'kov University, 1959, Vol 102, Works of the Radiophysics Faculty), No 3, pp 15-24 (from Referativnyy Zhurnal - - Elektrotekhnika, No 8, 25 Apr 60, Abstract No 6.7200)

A study is made of the problems involved in the experimental utilization of ponderomotor forces of electromagnetic waves in the VHF range and their use in radio engineering. The discussion includes the properties of ponderomotor forces in the VHF range, circuits and apparatus for measuring ponderomotor forces, and the sensitivity curves of the reflecting and absorbing elements of various circuits and antennas. The results of an investigation of ponderomotor forces by various means are given, and a description is given of the design and technical characteristics of various instruments for measuring transient power, radiated power, the pressure exerted by electromagnetic energy on gases, and superhigh power outputs.

91. Effect of Gaussian Interference on Two-Channel Phase Systems

"The Effect of Gaussian Interference on Two-Channel Phase Systems," by V. V. Tsvetnov, Tr. Mosk. aviats. in-ta (Works of the Moscow Aviation Institute), No 105, 1959, pp 26-67 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 6.7590)

The statistical properties of a sinusoidal signal and of gaussian interference in two-channel phase systems are considered, assuming that the channels are not identical, nor the interferences correlated. An analysis is given of the first absolute law of phase distribution (law of distribution of the instantaneous phase error without reference to the value of the amplitude of the "signal-plus-error" vectors in both channels) applicable to the case of correlated interferences and non-symmetrical channels.

IV. ENGINEERING

Automatic Control Engineering and Computers

92. Stability of Electropneumatic Servomechanism

"The Stability of an Electropneumatic Servomechanism," by V. Ye. Samoylov, Nekotory Voprosy Mekhaniki (MVTU, 88) (Some Problems of Mechanics (Moscow Higher Technical School, 88)), Moscow, 1958, pp 179-192 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 4.7102)

An analysis is made of the stability of an electropneumatic servomechanism consisting of an electronic amplifier-summator, an electromechanical relay, a pneumatic amplifier with a jet tube, a pneumatic actuator, and feedback circuits for various positions of the piston. The load on the piston is taken up by a spring with linear characteristic.

First, an equation of motion for the servomechanism is derived and examined, without taking into account the nonlinearity of the electronic amplifier and relay. It is shown that in the absence of friction in the piston actuator, the servomechanism is always unstable.

An equation of motion for the servomechanism is then derived and discussed, with the nonlinearity (saturation and hysteresis) of the electronic amplifier and relay taken into account. It is found that the stability range of the servomechansim is somewhat reduced by the nonlinearity.

An analysis is then made of the influence of various parameters of the servomechanism on its stability and on the nature of the self-oscillations. It is shown that increasing the reduced mass of the piston and decreasing the stiffness of the spring will reduce the frequency and increase the amplitude of the vibrations and impair the stability of the servomechanism, whereas increasing the volume of the cavity (cylinder) of the actuator reduces both frequency and amplitude of the vibrations.

Finally, an expression is obtained for the amplification factor of the servomechanism for the case when the variation of input singal is infinitely slow.

93. Balanced Transmitter for Low-Frequency Telemetering System

"Balanced Transmitter for Low-Frequency Telemetering System," by G. I. Formin, Trudy Vsesoyuznogo Nauchno-Issledovatel'skogo Instituta Elektroenergetiki (Works of the All-Union Scientific Research Institute of Electric Power Engineering), No 7, 1958, pp 202-207 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 4.7309)

The Central Scientific Research Electrical Engineering Laboratory (TsNIEL) developed a new balanced transmitter for low-frequency telemetering systems which is actually a modernized version of the GChB-1 type transmitter. A description is given of the operating principle of the GChB-1, which is a static automatic frequency controller for alternating current. By means of an induction transformer and rectifier, the measured signal (angle of displacement of the loop) is converted into a dc voltage, which is compared with the output voltage of the frequency meter. The difference signal is amplified by the unbalanced amplifier and fed to the control winding of the saturable reactor which controls the alternating-voltage variable-frequency oscillator. The output signal of the oscillator is fed to the input of the frequency meter. The output frequency of the oscillator serves as a measure of the angle of displacement of the loop of the induction transformer. During a change of the measured value from zero to maximum, the frequency varies from 44 to 27 cps.

In the new version of this transmitter, the most complex unit, the electronic unbalanced amplifier, which contains four triodes, is dispensed with. Since the output power of the balanced signal is low, and the output signal does not guarantee immediate control by the saturable reactor at a low value of the static factor, the problem of the greatest value of the static factor was considered. It is shown that the static factor can be increased appreciably without altering the precision of the transformation. A skeleton diagram is given of the new balanced transmitter (without the induction transformer and power supply). The primary characteristic, the dependence of the output frequency on the voltage of the induction transformer, is emphasized. The additional error resulting from the voltage variation of the power supply amounts to plus-minus 15 percent; the error caused by the frequency variation does not exceed 0.88 percent. The error resulting from the plus-minus 20-degree variation of ambient air temperature is not more than 0.85 percent; this was accomplished by using a resistance with a low temperature coefficient. The time required to fix a frequency during the variation of the measured value from zero to half-maximum is not over one second.

94. Transients in Reversing Synchro System

"Transient Processes in a Low-Power Reversing Device With a Synchro Receiver Fed From a Dynamoelectric Amplifier With a Cross Field," by V. M. Larin, Izvestiya Leningradskogo Elektrotekhnicheskogo Instituta, (News of Leningrad Electrical Engineering Institute), No 37, 1959, pp 205-220 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 3.5692

The transient processes are considered in a reversing system with an amplidyne having a reversing rate of 0.5 - 2.0 cycles per second. A differential equation (fourth order with respect to the rpm of the motor) is derived which describes the transient processes in the system. It is shown that the primary factor is the duration of the transient process of the motor, which is characterized by the electromechanical constant. The electromagnetic transient process ordinarily decays before the armature of the motor reaches an appreciable rate of rotation. The results of the calculation of the processes of starting and reversing in accordance with formulas given in the work are in satisfactory agreement with experimental data.

95. Electromagnetic Moment During Rotor Spurts in Induction Motors

"An Approximation Method of Estimating the Influence of Rotor Acceleration in an Induction Motor on the Electromagnetic Moment Generated by It," by V. A. Shubenkov, Trudy Ural'skogo Politekhnicheskogo Instituta. Sbornik 90 (Works of the Ural' Polytechnic Institute. Collection No 90), 1958, pp 157-166 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 3.5698)

The transient electromagnetic moment developed by a three-phase induction motor during an abrupt change of rotor speed can differ considerably from the steady-state value at the same speed. The simplest criteria are established with which (without complex mathematical treatment) it is possible to estimate the influence of the rate of change of rotation (or of the slip s) of the rotor on the value M (electromagnetic moment) produced by the motor. The solution of the problem is based on a method of calculating transient processes according to simplified universal cures (Referativnyy Zhurnal -- Elektrotekhnika, 1960, Abstract No 34794). Notions are introduced for the relative moment $\mu = M/M_k$; relative slip $\theta = S/S_k$ and relative time $\tau = t/T'_r$. Here M_k and S_k are statistical values of the moment and slip; T'_r is the time constant of the rotor with shorted stator. It is shown that the dynamic characteristics of motors are the same, if their relative initial slips and accelerations are similar.

The expression $k_m = \frac{d}{s_k^2} = \frac{d}{d}$, where $d = \frac{ds}{dt}$, serves as a criterion characterizing the degree of deviation of the dynamic and mechanical characteristic from the statistical. With the aid of k_m, it is possible to establish graphically the relationship

$$\frac{\Delta M_m}{M_k} = \Delta \mu m = f(k_m).$$

The approximate analytical relationships are determined by the formulas

$$\Delta \mu m = 0.0425 \sqrt{k_m} - 0.18, \text{ when } \theta > 0$$

and

$$\Delta \mu m = 0.0425 \sqrt{k_m} \quad \text{when} \quad \theta < 0.$$

It is also possible to construct approximate relationships for the relative slips at which the maximum transient moment occurs. A formula is also given for the joint solution of the equation $\Delta \mu = f(k_m)$ and the equation of the drive motion. The described method may be used for the calculation of transient processes during dynamic braking.

96. Experimental Control Installation for Mine Elevator

"Experimental Investigation of a Control System for a Mine Elevator With Induction Drive Regulated by an Electrical Speed Controller With a One-Step Amplification," by G. Ye. Ivanchenko, Nauchnyy Trudy, Karagandinskiy Nauchno-Issledovatel'skiy Ugol'nyye Institut (Scientific Works, Karaganda Scientific Research Coal Institute), No 3, 1958, pp 250-273 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 3.5742)

The principal parameters are given for an experimental installation. Oscillograms of the control process show good agreement of computed and real data.

97. Transient Processes in Electric Drive With Powder-Magnet Clutch

"An Investigation of the Transient Processes of an Electric Drive With a Powdered Electromagnetic Clutch," by V. A. Mikhaylov, Nauchnyye Trudy Khar'kovskiy Gornyy Institut (Scientific Works, Khar'kov Mining Institute), No 5, 1958, pp 97-102 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 3.5787)

The transient processes are considered in a drive with an electromagnetic powdered clutch for cases when the clutch is engaged under load and engaged during braking. It is found that the clutch moment is proportional to the slip and not to the square root of the slip. The magnetization curve of the powder mixture is assumed to be rectilinear. The acceleration diagram of the drive consists of three parts: the increase of the clutch moment during idling of the driven shaft, the acceleration of the clutch up to complete engagement, and the acceleration of the drive as the motor revs up to full speed. The computed formulas produced results in good agreement with experimental findings.

98. Group Output Controller for Heavy-Duty Compressors

"Circuit Diagram of a Group Controller for the Output of Compressors," by A. D. Shkol'nikov and B. F. Nipich; Byulleten' Tekhnicheskoy Informatsii. Tsentral'nyy Institut Nauchno-tekhnicheskoy Informatsii Gosudarstvennogo Nauchno-tekhnicheskogo Komiteta Soveta Ministrov KazSSR. Seriya Gornometallurgicheskaya Toplivnaya i Khimicheskaya Promyshlennost' (Technical Information Bulletin. Central Institute of Scientific-Technical Information of the State Scientific-Technical Committee of the Council of Ministers Kazakh SSR. Series: Mining-Metallurgical, Fuel and Chemical Industry), No 8, 1958, pp 84-85 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 3.5786)

Since existing controllers for the output of heavy-duty piston compressors are difficult to regulate and operate in a slipshod manner, a solenoid control circuit is proposed in which the pressure indicator is an electrical-contact manometer with a high reset factor. An impulse from the indicator through an intermediate relay is fed to the solenoid which raises the coupling rod of a servomechanism, thereby providing access of compressed air to the clamping device. Only one compressor in the group is used to control the pressure, and the choice of compressor is done with a throw-over switch. The control arrangement presented here guarantees reliability, definition, simplicity, and sustained pressure in the main line. Other advantages are enumerated. A skeleton diagram of the output controller circuit is also given.

99. Automation of Mine Elevators in Moscow Basin

"The Principle and Layout for the Automation of Multicable Elevators With Induction Drive Under Conditions of the Moscow Basin," by I. A. Kleushev, Mnogokanatnyy Pod"em (The Multicable Elevator), Moscow, Ugletekhizdat, 1958, pp 53-59 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 3.5745)

Since the power rating of the majority of drive motors for the elevators designed for conditions of the Moscow basin is 100-150 kilowatts, and the maximum speed is low (2-5 meters per second), an induction drive is both rational and economic. This article describes, for the automation of the periods of deceleration and "pulling up to a stop," an arrangement which provides a single-step frequency control during which the elevator motor is disconnected from the circuit and switched over to power supplied through a special frequency mixer with a frequency corresponding to the rate of speed during the "pulling up to a stop." The frequency mixer consists of a small aggregate made up of a synchronous generator (series S or SG) rated at 1,500 or 3,000 rpm and an induction motor rated at 300 or 500 rpm, respectively. A formula is recommended for an approximate determination of the output power of the frequency-mixer aggregate; a skeleton diagram of an automated single-skip elevator installation is given, together with a description of its operation.

100. Electrical Simulation of Servomechanisms

"Electrical Simulation of AC Servodrives," by L. V. Bokshitskiy and F. M. Shlykov; Novocherkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika, No 5, May 60, pp 52-61

The problem of designing reliable ac servomechanisms has become very important since aircraft power supply has almost universally been changed to 400 cps frequency. The analytical analysis and existing engineering methods of calculation for the servo systems are both cumbersome and inaccurate because the induction motors of such systems are basically nonlinear elements.

The article describes the construction of a servomechanism system designed at the Moscow Power Engineering Institute and the method of simulating its performance with the aid of an electric circuit. Such a servomechanism system incorporated both coarse and fine control servomotors. The oscillograph records have shown that the electric simulating circuit depicted with a sufficient degree of accuracy the actual performance of the servomechanism system. This simulating circuit allows examinination of the effect of individual parameters on the dynamic performance of the

system, such as: sluggishness of the intermediate amplifier, amplification factor, the time constant of the stabilizing circuit, saturable reactor time constant, the range of insensitivity of the reversing element, and the load torque. The frequency response in the range of 0.1-5.0 cps of the closed system were taken.

The results thus obtained agree sufficiently well with figures obtained during the experimental investigation of the system, and in some degree supplemented the latter. Simulation of the servomechanism was carried out with the MN-2 machine at the Computer Center of the Moscow Power Engineering Institute under the direction of N. I. Chelnokov.

101. Ten-Channel Automatic Control Device

"Ten-Channel Automatic Electronic-Relay Optimizer," A. B. Shubin; Moscow, Avtomatika i Telemekhanika, No 5, May 60, pp 624-632

An electronic-relay device for automatic search of extremum of a function with many variables has been designed and assembled by I. N. Bocharov, A. V. Kalinina, R. I. Stakhovskiy and A. B. Shubin. This automatic control device, called an optimizer, is capable of determining the extremum of a function with as many as ten variables.

The function for which the extremum is sought and the limiting functions are fed to the optimizer in the form of dc voltage having a range of +100 to -100 v. The optimizer can operate in conjunction with a controlled object which supplies continuously the data on the controlled function, or with controlled objects which supply only sampled data. The optimizer consists of two main units: the operational unit and the control unit.

This device was originally designed for operation in conjunction with various electronic simulating circuits having relay controls. However, the principles of operation employed in this device can be well extended to optimizers capable of controlling directly various actual processes. The automatic control of actual processes can also be accomplished by first determining the desired extremum from a simulating circuit and then applying the data thus obtained to the control of the actual process. The over-all dimensions of the optimizer are 650 x 500 x 450 cm.

102. Rumanian Computer Research Includes Studies on Machine Translation

"Computers in the Economy," by Laszlo Nemeti, deputy director of Computation Institute (Szamitasi Intezet) in Cluj; Cluj, Korunk, Jun 60, pp 647-650

Beginning with a general discussion of the practical uses of mathematics, the author notes that his institute, the Computation Institute in Cluj is primarily concerned with numerical analysis and related fields. This institute consists of several departments and subdepartments

The theoretical research department is headed by Prof Dumitru Vasile Ionescu and deals with the construction theory of functions and its applications to numerical analysis. Research works are published in the semi-annual 400-page periodical Studii si cercetari de matematica. Although most of the work is done on an individual basis, the department holds a work session once each week for reports and debates.

The computer research department had no predecessor in the Cluj area and was "created out of nothing," the author says. The first automatic computer built in the institute will be put into operation in 1960. A Computation Laboratory (Szamitasi Laboratorium), headed by Prof Jeno Gergely, constitutes a subdepartment of the Computation Institute. Lascu Bal and Ferenc Rado of the institute prepared the first Rumanian textbook on nomography. This group also deals with the theory of programing for electronic computers, including methods of automatic programing. Workers in this subdepartment also deal with use of various methematical methods in the economy and the author notes that "here, the methods of linear programing are very promising."

The author lists several computation projects undertaken for specific enterprises: preparation of tables and diagrams for gearwheel manufacture, etc. Researchers from the institute have given lectures in cooperation with the Scientific Association of Physicians (Orvosok Tudomanyos Egyesulete). They have also undertaken joint studies with the Rumanian Academy's Linguistic Science Institute (Nyelvtudomanyi Intezet) in Cluj and with the linguistics faculty of the Babes-Bolyai Science University on methods and problems of machine translation.

The author suggests extension of theoretical research of various areas of probability calculation: the Monte Carlo method, information theory, and theory of strategic games.

In the future, the Computation Laboratory will no longer perform calculations for enterprises; this function will probably be taken over by computation centers as it has been in the Soviet Union, the article says. The Computation Laboratory would then provide the new centers with methods and procedures.

Electrical Engineering

103. Voltage Level Problems in Industrial Networks

"Deviations and Levels of Voltage in the Networks of Industrial Establishments," by G. V. Serbinovskiy, Materialy Nauchno-tekhnicheskoy Soveshchaniya po Opredeleniyu Elektricheskikh Nagruzok i Regulierovaniye Napryazheniya Promyshlennostykh Predpriyatiy (Reports of the Scientific Technical Conference on the Determination of Electricity Loads and the Regulation of the Voltage of Industrial Establishments), Moscow-Leningrad, 1958, pp 42-55 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 3.5663)

A list is given of the abnormalities of operation of electrical equipment, including illumination equipment, which cause a deviation of voltage. A one-percent voltage increase causes a 2-percent increase of reactive power input and a 0.6-percent impairment of the power factor. Unsatisfactory control equipment is the main cause of deviations of voltage in the buses of a great number of power stations and distribution stations. The voltage deviations at consumers lines are too high because of the unsatisfactory condition of networks, defects in the arrangement of electrical supply, and the lag in the construction of electrical networks. One radical solution is the control of voltage at the consumer's intake by means of transformers which are activated when a load is being drawn. An effective measure would be changing the network to a higher voltage without changing the system. A considerable role in the regulation of voltage can be played by synchronous motors and an arrangement of capacitors providing an automatic control over the power as it is drawn. Organization plans show a lack of sufficient initiative in the search for rational schemes of power supply and do not give sufficient attention to schemes with automatic disconnection of part of transformers, nor to schemes involving a linear compensation of voltage. The basic assumptions are given for the establishment of guides to the planning and utilization of equipment to guarantee a uniform voltage level.

104. Efficiency of Combined Gas and Steam Turbine Installation

"Efficiency of Medium- and High-Capacity Steam-Gas Installations With High-Pressure Steam Generator," by M. I. Kornev and G. I. Moiseyev; Moscow, Teploenergetika, No 5, May 60, pp 33-38

In the past few years extensive research has been carried out in the USSR on the design of combined gas and steam turbine power-generating installations with a view toward attaining higher over-all thermal efficiency than has been possible with conventional steam turbine installations. An important component of such a combined installation is the high-pressure steam generator which generates the steam for the turbine, and serves at the same time as a combustion chamber for the gas turbine.

Two types of installation were studied: one generating 110 tons of steam per hour at a steam pressure of 110 atm abs and a temperature of 540°C and the other generating 210 tons of steam per hour at a pressure of 140 atm abs and temperature of 570°C. Although Soviet machine building plants are now manufacturing numerous models of small- and medium-capacity gas turbines, the production of high-pressure steam generators has not yet attained any satisfactory level.

It was found that the combined gas and steam turbine installations are about 10% more efficient than a similar steam turbine installation. In addition, the combined installations save about 25% of metal in fabrication and have much smaller over-all dimensions.

105. Instability of Arc Discharge

"Phenomena of Internal Instability of an Arc With a Mercury Cathode. II. Nonstationary Processes in the Cathode Region of the Arc," by I. G. Kesayev, All-Union Electrical Engineering Institute imeni Lenin; Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 6, Jun 60, pp 674-684

The first part of the work dealt with spontaneous extinction of the arc glow. The stability of a low pressure arc with a Hg cathode is further analyzed. New data on nonstationary phenomena in the cathode region are revealed and connected with oscillations of the discharge glow voltage are shedding light on the reasons for the spontaneous arc extinctions and on possibilities of extending the arc's service life with increasing current.

106. Thermoelectromotive Force of Natural Thermocouples

"Investigation of the Mean Thermoelectromotive Force of a Natural Thermocouple," by M. F. Semko and V. I. Bondar', Trudy Khar'kovskogo Politekhnicheskogo Instituta (Works of the Khar'kov Polytechnic Institute), Vol 19, 1959, pp 19-29 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 4.6984)

The temperature of the contact surfaces of a cutting tool customarily is determined by means of natural thermocouple which is formed by the tool and the work. The authors devised a method to describe the connection between the measured thermoelectromotive force and the temperature distribution on the contact surface of the tool.

High Speed Photography

107. New Soviet High-Speed Camera

"Photographing a Missile in Flight" (unsigned article); Prague, Obrance Vlasti, 17 Jun 60, p 5

According to a brief news item, the USSR has developed a high-speed film camera capable of taking nearly 3 million pictures per second. This camera will be used primarily to record "those events which have thus far eluded the eyes of man," for example, a missile in flight, or for detailed study of explosions which occur when gases are ignited in jet engines, etc.

Miscellaneous

108. Conference on Gear Drives To Be Held in Odessa

"Information," by A. Torgovitskiy, scientific secretary of Organizational Committee of the conference; Moscow, Vestnik Mashinostroyeniya, No 4, Apr 60, p 44

"The Central Board of the Scientific-Technical Society of the Machine Building Industry and the Moscow, Leningrad, and Odessa Departments, with the participation of the Institute of Machine Studies of the Academy of Sciences USSR, the State Scientific-Technical Committee of the Council of Ministers USSR, the State Committee of the Council of Ministers USSR on Automation and Machine Building, and the Ministry of Higher and Secondary Special Education of the Ukrainian SSR are organizing an All-Union Scientific-Technical Conference on Problems of Quality and Strength of Gear and Worm-Gear Transmissions (gear drives). The conference will be held in Odessa in mid-1961 at the Odessa Polytechnic Institute.

"Fundamental problems of the conference are: an exchange of experience on increasing carrying capacity, decreasing size and weight, increasing reliability, increasing efficiency of gear drives and reduction gears, and an examination of problems concerning the development of a single inter-branch procedure for computing gear drives.

"It is proposed to discuss at the conference reports and communications which will be previously published and distributed to the delegates for study."

109. Forthcoming Conference on Ultrasonics in Industry

"Announcement," (unsigned article); Moscow, Akusticheskiy Zhurnal, Vol VI, No 2, Jun 60, p 266

"The All-Union Conference on the Use of Ultrasonics in Industry (machine building, metallurgy, chemical, food, light and other branches) will be held in Moscow 22-26 November 1960. Problems of technology and equipment will be examined at the conference.

"Declarations on reports (in the form of full abstracts) should be sent before 1 June 1960 to the address of the Organizational Committee: Moscow, ul. Kirova, d. 7. Moskovskiy Dom nauchno-tekhnicheskoy propagandy im. F. E. Dzerzhinskogo."

V. MATHEMATICS

110. Separatrix Estimation

"Separatrix Estimation by the Method of Successive Approximations," by V. A. Tabuyeva, Ural Polytechnic Institute imeni S. M. Kirov; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 2(15), Mar/Apr 60, pp 178-189

A differential equation

$$\frac{d^2x}{dt^2} = f(x, \frac{dx}{dt}) \tag{1}$$

of the second order, equivalent to the system of differential equations

$$\frac{dx}{dt} = y, \quad \frac{dy}{dt} = f(x, y) \tag{2}$$

is considered.

The function $f(x, y)$ is assumed continuous together with its partial derivatives on the entire xOy plane as well as satisfying the following conditions:

$$f(x + 2\pi, y) = f(x, y) \text{ for all } x, y;$$

$f(x, y)$ decreases with respect to y for all x, y;

$$f(x_1, 0) = f(x_2, 0) = f(0, 0) = 0 \tag{3}$$

where $x_1 > 0$, $x_2 < 0$ are approaching to $x = 0$ of the null function $f(x, 0)$, for $x_1 - x_2 = 2\pi$; $xf(x, 0) < 0$ in the neighborhood of $x = 0$;

$$\int_0^{2\pi} f(x, 0)\, dx > 0;$$

$$\lim_{y \to +\infty} f(x, y) < 0, \quad \lim_{y \to -\infty} f(x, y) > 0 \text{ for any } x.$$

For the system of differential equations (2) satisfying conditions (3), it is possible to conduct an investigation of the possible varieties of a qualitative diagram for the distribution of integral curves; in particular, an investigation of the form of the region of attraction of the null solution of system (2). Thus, as has been shown before (see V. A. Tabuyeva, "On the Problem Concerning the Form of the Region of

Attraction of the Null Solution of a Differential Equation," Izv. vuzov, matem., No 4(5), 1958) the solution of the problem concerning the presence of this or that solution from the possible varieties of qualitative diagrams or system (2), satisfying hypotheses((3), is equivalent to the solution of the problem concerning existence and absence of a periodic with respect to x, positive for all x, solution $\bar{y}(x)$ of the differential equation

$$\frac{dy}{dx} = \frac{f(x, y)}{y} \qquad (4)$$

obtained from equation (2).

The problem of searching for an estimate for the region of attraction of the null solution of system (2), and also the problem of finding critera specifying the presence of one of the possible qualitative diagrams for the distribution of the integral curves of the system, equivalent to the problem concerning the existence and absence of a periodic solution $\bar{y}(x)$ of equation (4), lead to an estimate of the separatrixes $y = S_1(x)$ and $y = S_2(x)$ of the system (2). (The separatrix $y = S_1(x)$ corresponds to trajectory of system (2), bordering for $t \to +\infty$ on the singular saddle point $(x_1, 0)$ in its second quadrant. The separatrix $y = S_2(x)$ corresponds to the trajectory of the system (2), bordering on the singular and also saddle point $(x_2, 0)$ in its first quadrant).

The purpose of our work is the consideration of successive approximations for estimating the separatrixes $y = S_1(x)$ and $y = S_2(x)$, and also the evolvement of criteria (in addition to those found earlier in the work of the author referred to above) determining the possible distribution of integral curves of system (2), satisfying the assumption (3) of the work by the same author ["Application of the Method of Successive Approximations to the Finding of Separatrixes," DAN SSSR, Vol 3, No 2, 1956], that is, evolvement of criteria for the existence and absence of a periodic solution $\bar{y}(x)$ to the differential equation (4).

For plotting of the curves estimating the separatrixes $y = S_1(x)$ and $y = S_2(x)$, successive approximations are studied defined by the operators

$$y_n(x) = \int_{x_1}^{x} \frac{f(x, y_{n-1}(x))}{y_{n-1}(x)}\, dx \quad (i = 1, 2), (n = 1, 2, 3, \ldots)$$

and $$y_n(x) = \sqrt{2 \int_{x_i}^{x} f(x, y_{n-1}(x))\, dx} \quad (i = 1, 2), (n = 1, 2, 3, \ldots),$$

obtained quite naturally from the differential equation (4).

111. Locally Compact Groups Investigated

"On the Theory of Special Locally Compact Groups," by V. M. Glushkov; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 11, No 4, Dec 59, pp 347-351

The author studies special locally compact groups, i.e., such locally compact groups which are locally nilpotent and satisfy the descending chain condition for closed commutative subgroups. It is proved that special locally compact groups satisfy the descending chain condition, not only for closed commutative subgroups, but for arbitrary closed subgroups as well. Any special locally compact group is topologically isomorphic for the factor group on the central discrete subgroup of the final direct product of the one-dimensional toroidal groups and of the discrete special p-groups.

112. Approximate Plotting of Quasiconformal Mappings

"Approximate Plotting of Quasiconformal Mappings of a Circle Onto Certain Regions," by B. A. Vertgeym. Perm Mining Institute; Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 2 (15), Mar/Apr 60, pp 30-43

Problems concerning the approximate plotting of certain quasiconformal mappings are considered. The problem concerning the mapping of a circle onto a certain region during which infinitely small circumferences are transformed into given ellipses leads to a nonlinear functional equation with respect to the boundary values of the mapping function. The applicability of the Newton method to this problem, developed by L. V. Kantorovich, is proved for the approximate solution of nonlinear functional equations. Determination of the successive approximations leads to the solution of a linear boundary value problem. After the corresponding transformation of equations, the theory of I. N. Vekua concerning the theory of linear boundary value problems for a Karleman system is employed for investigation of the linear boundary value problem.

The fundamental results of the work (without proofs) are published by the author in the paper "Concerning the Approximate Construction of Certain Quasiconformal Mappings," DAN SSSR, Vol 119, No 2, 1958, pp 203-206.

The problem is considered concerning the construction of a quasiconformal mapping of the circle T, $|z| < 1$, onto the region G in the w-plane with the help of the function

$$w = w(z) = u(x, y) + iv(x, y),$$

satisfying the linear elliptic system

$$\left.\begin{aligned} au_x + bu_y &= v_y \\ -bu_x + au_y &= -v_x \end{aligned}\right\}, \qquad a(x, y) > 0,$$

under the normalization conditions

$$w(0) = 0, \quad w(t_1) = w_1 = u_1 + iv_1,$$

where $w_1 \in \Gamma$, $|t_1| = 1$. The curve Γ is the boundary of the region G and is given by the equation

$$F(u, v) = 0.$$

It is assumed that a, b, and F are twice differentiable continuous functions, for which the derivatives of F in a neighborhood of the line Γ satisfy the Lipschitz condition

$$\left|F''_{u^i v^k}(u_1, v_1) - F''_{u^i v^k}(u_2, v_2)\right| \leq K(\left|u_1 - u_2\right| + \left|v_1 - v_2\right|),$$

$$i + k = 2; \; i, k = 0, 1, 2,$$

$$\left|\text{grad } F\right| \geq m_0 > 0,$$

$$\max \left|F''_{u^i v^k}\right| = m.$$

113. Families of Quasiconformal Mappings

"Concerning the Normality of Families of Quasiconformal Mappings," by P. P. Belinskiy, Mathematics Institute of Siberian Branch of Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 4, Oct 59, pp 651-652

As is known (see M. A. Lavrent'yev, Matem. sborn., Vol 42, No 2, 1935, I. N. Pesin, DAN, Vol 102, No 2, 1955), the family of normal quasiconformal mappings of a unit circle onto itself is compact. This property of quasiconformal mappings together with the invariance relative to auxiliary conformal transformations allows one to draw a complete analogy with conformal mappings during consideration of compact or normal families of quasiconformal mappings. It is possible to raise the question concerning consideration of all the families of mappings, analogous to the conformal, from the viewpoint of normality. However, consideration of the normal families without any additional limitations does not represent

particular interest in view of the fact that a similar family may contain a perfectly arbitrary sequence of mappings $w = f_n(z)$, satisfying only the condition $f_n(z) \to \infty$ as $n \to \infty$. The valuable property of conformal mappings is that any sequence of mappings may be, with the help of normalization (that is, with the help of transformations similar in the z and w planes), reduced to compactness in the sense of convergence inside the kernel. Quasiconformal mappings also possess this property. It is interesting that the inverse assertion also holds.

The rest of the article was devoted to the proof of the following theorem:

Let M be the family of functions $\{w = f(z)\}$ possessing the properties: (1) The functions f (z) are defined in the regions and homeomorphic mappings are made. (2) Auxiliary transformations of the form $z' = az + b$ and $w' = aw + b$ do not belong to the family of functions. (3) Every sequence of functions $w = f_n(z)$ of the family M defined in the regions D_n with kernel D, different from zero, may be transformed into the compact form with the help of a normalization of the form $w' = a_n f_n(z) + b_n$. Compactness is understood in the sense of uniform convergence within D to the mapping of the family. Then mappings, accomplished by the functions of the family, turn out to be quasiconformal with deformations, bounded by a certain number q.

114. Approximation of Functions by Linear Positive Operators

"On the Order of Approximation of Functions by Linear Positive Operators," by R. G. Mamedov, Institute of Physics and Mathematics of Academy of Sciences Azerbaydzhan SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 4, Oct 59, pp 674-676

Let $W_n(f; x)$ be a sequence of linear, positive operators given on a certain space E of functions f(x). We set for each function $f(x) \in E$

$$\Delta_n(f; x) = W_n(f;x) - f(x).$$

It is known that the orders of approximation of functions by certain concrete linear, positive operators has been sufficiently well studied by a number of authors.

P. P. Korovkin in his works appearing in DAN, Vol 114, No 6, 1957, and Usp. matem. nauk, Vol 13, No 6(84), 1958, studied the orders of smallness of the quantity $\Delta_n(f; x)$ in the case when the value of the linear, positive operator $W_n(f; x)$ for any function continuous on $[-1, 1]$ has an algebraic or trigonometric polynomial of order not greater than n.

In the present work it is proved that the orders of approximation of functions by any linear, positive operators may be estimated from above by means of the modulus of continuity of these functions. It is assumed that all the linear, positive operators in this work satisfy the condition

$$W_n(1; x) = 1.$$

115. Extensions of J-Symmetrical Operators

"On the Theory of Extensions of J-Symmetrical Operators," by N. A. Zhikhar'; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 11, No 4, Dec 59, pp 352-365

Let H be a Hilbert space, and let J be some conjugation operator in H. A linear operator A with domain D_A dense in H is called J-symmetrical if $A \subset J A^* J$. We say that the operator A is J-self-adjoint if $A = J A^* J$.

The present paper deals with the J-self-adjoint extensions of J-symmetrical operators in H and its application to the one-dimensional boundary problem on a half-axis.

VI. MEDICINE

Aerospace Medicine

116. Conditions of Space Travel

"Faster and Higher," by V. V. Parin; Moscow, Zdorov'ye, No 5, May 60, pp 1-2

The author parallels the experience of the legendary Rip Van Winkle with that of a man who falls asleep in Russia at the beginning of the 20th Century and awakes 60 year later. He recounts a number of electronic, atomic, and other marvels which would confront this man, after which he discusses the conquest of space, one of the most intriguing of contemporary problems.

He reviews the three critical rates of mechanical motion of bodies: a body reaching the so-called first cosmic velocity of about 8 kilometers per second can, under appropriate conditions, become an artificial earth satellite; a rocket traveling at the second cosmic velocity of about 11.2 kilometers per second overcomes the gravitational pull of the earth, enters space, becomes part of the solar system; at a speed of 16.3 kilometers per second, a body leaves the solar system and goes beyond its limits. These three speed barriers were, until recently, of theoretical significance only. In our time, two of them have passed from the realm of theory into that of practical application.

Space medicine, a new science born a few years ago, combines many branches of knowledge, such as biophysics, biochemistry, physiology, aviation medicine, geophysics and astrophysics, radiology, aerodynamics, rocket engineering, radioelectronics, etc. Although much has been accomplished in space medicine, much more remains to be done.

Space medicine achieves its purpose by extensive experimentation on animals. Many complicated problems must be solved before a man can be put into space. Man in space will encounter a number of conditions in the upper layers of the atmosphere which may negatively affect the vital activity of his organism. Greatly rarefied atmosphere, the absence of molecular oxygen, and a high concentration of ozone are some of these conditions. Barometric pressure beyond the limits of the earth's atmosphere drops to zero. The presence of ionizing radiation and the short-wave portion of the ultraviolet spectrum must be taken into consideration. The effects of great gravitational pull and prolonged periods of weightlessness must also be thoroughly investigated.

It has been possible to simulate complete weightlessness by using special elevators, although the condition lasts only 15-30 seconds. It is interesting to note, however, that humans tolerated weightlessness satisfactorily during these few seconds, and blood circulation and respiration remained almost undisturbed. The only adverse conditions noted were disturbances in voluntary movements, which can be prevented by intensive conditioning.

Information obtained from the second artificial earth satellite showed that the pulse rate and respiration of its canine passenger increased during take-off and during the period of weightlessness, and that the heart activity gradually returned to normal. The prolonged period of weightlessness apparently did not produce any adverse and permanent changes in the organism of the dog.

On the basis of all data collected, scientists have concluded that the efficiency and normal activity of a human organism is not disrupted in any way as a result of weightlessness. A long period of weightlessness may cause an inaccurate idea of the position of articles in space, a sensation of falling, mild vertigo, and weakness. All these manifestations are the result of disturbance of the normal function of the organs of equilibrium and the apparatuses of perception situated in the skin, muscles, tendons, etc.

The steps taken to date in the study of the effects of weightlessness of a living organism are only the initial ones. Researchers have much work to do to clarify what effects complete weightlessness, lasting many days or months, could have on the human organism.

Scientists already have valuable information about the effects of other factors, such as low barometric pressure, on the organism. A multitude of reliable protective systems are being devised as aviation technology and aviation physiology make greater progress.

The effects of cosmic rays and ultraviolet and corpuscular radiation on a living organism have not yet been sufficiently investigated.

Sufficient data on the effects of acceleration on the organism have been collected. Experiments in which dogs were sent to altitudes of 100-450 kilometers, performed in the USSR since 1950, have made it possible to conclude that a living organism tolerates accelerations satisfactorily if it is placed in the cabin in the proper position. The action of G forces can be reduced considerably if special compensating garments, which compress certain parts of the body and prevent vessels from being overfilled with blood, are worn.

Obviously these experiments must be repeated. Animals returned to earth after long periods in artificial satellites must be placed under observation for a long time. It is necessary to establish exactly the harmful consequences of exposure to cosmic rays in outer space. Data accumulated by scientists suggest that this stage of investigation will be of short duration and that brief, manned flights into outer space will be quite possible in the not-too-distant future.

117. Simulated Space Flight Described

"A Giant Is Preparing to Jump," by Ye. Veltistov; Moscow, Nedelya, No 12, 15-21 May 60, p 6

"The door of the altitude chamber swings shut. The pumps begin to pump air out. The human occupant, sitting in a chair, 'takes-off' to high altitude at the wink of an eye. He finds himself in a similar situation as an alpinist advancing at a rapid pace toward the top of Mount Khan-Tengri.... Examination of diaries of alpinists reveal that the condition of even the most hardened sportsmen becomes weakened as they reach higher altitudes."

This is how the author of this article begins his story of a simulated flight of a human being in an altitude chamber. He says that the protective garment that the spaceman was wearing made it possible for him to ascend to an altitude of 8,000 meters and beyond.

This strange performance, with overtones of science fiction, takes place before the eyes of people who have an opportunity to watch the new movie "Prior to the Leap Into Outer Space." The spectators can see the face and movements of the man in the altitude chamber; after that the scene shifts to the foot of a trainer: a special tower. Here, under the propelling force of a catapult, a human being experiences a momentary period of great force of gravity and then lands safely back on earth.

The future spacemen must train for the job and, like athletes, they must exercise their bodies. Each new spaceman will strive to break the record of the spaceman before him. Each record-breaking spaceman will become a giant in the eyes of the entire world. Fiction has prepared the human spaceman for this role; he will become an all-powerful individual if he successfully lands his space vehicle on the moon and brings life to that barren planet.

Until recently we read about the amazing condition of weightlessness only in novels of Jules Verne and Wells and in the scientific works of Tsiolokovskiy. Cameras now can automatically photograph animals in a state of weightlessness.

Experiments on animals also have helped scientists to solve the problem of oxygen supply to space travelers. White rats have been placed under a glass jar where they breath oxygen generated in an aquarium of microscopic algae.

Thousands of letters, addressed "Moscow, Sputnik," have been received. They come from both young people and people of considerable experience. Their writers ask to be the first spacemen.

The personnel of the Moscow studio of scientific-popular films are making films depicting the Soviet patriots who wish to be the first spacemen. V. Kapitanovskiy and V. Shreyberg, the script writers, V. Morgenshtern, the director-producer, and G. Lyakhovich, the cameraman, comprise the personnel of the studio.

Immunology and Therapy

118. Preparation for Gas Gangrene Prevention Developed

Moscow, Meditsinskiy Rabotnik, 15 Jul 60, p 2

"Khar'kov. Galina Petrovna Cherkas, Doctor of Biological Sciences and director of the Scientific Research Institute imeni I. I. Mechnikov, has developed a purified, complex preparation for the prophylaxis of gas gangrene. She has worked out a rational schedule of immunization and revaccination with this preparation.

G. P. Cherkas is now working, in cooperation with other scientists, on developing a complex preparation for the prophylaxis of tetanus and botulism."

A photograph accompanying this item shows G. P. Cherkas and L. G. Podgornaya, physician-microbiologist, standing beside an electron microscope in the laboratory.

Oncology

119. Neocyde -- Antitumor Preparation

"Data on the Application of Neocyde, a New Antitumor Preparation in an Oncological Clinic," by E. Katinas, Sveikatos apsauga (Lithuania), 1958, No 10, 18-25 (from Referativnyy Zhurnal -- Biologiya, No 6, 25 Mar 60, Abstract No 27785, by A. M. Ginzburg)

"Sixty-nine patients suffering from inoperative cancer of different localization were treated with neocyde. Thirty-two of them reported improvement in their general condition; a rise in Hb was noted.

Modifications in the hematological indexes caused by radiation therapy became less expressed. The necessity for the improvement of the technology of the production of the preparation, increase of its activity, and simplification of its applications is pointed out."

120. Effect of Cortisone on Neoplasms

"Does Cortisone Therapy Stimulate the Development of the Neoplastic Process?" by C. C. Dimitriu and V. Beroniade, Med. Interna (Rumania), 1958, 10, No 10, 1563-1569 (from Referativnyy Zhurnal -- Biologiya, No 6, 25 Mar 60, Abstract No 27908, by M. D. Kunichan)

"Three cases of the use of cortisone in the therapy of patients suffering from neoplasms which led to the progressive development of the disease are described. Despite the numerous data on the favorable effect of cortisone, facts are available which fail to confirm this data. The authors point to the following: the rapid growth of neoplasms following adrenalectomy and hypophysectomy; the more rapid development of induced tumors under the effect of cortisone; the rapid development of metastases under the effect of cortisone even after the development of the primary tumor is arrested; the beneficial results obtained in the therapy of cancer of the mammary glands by two-sided adrenalectomy, and the rapid development of heterogenic tumors upon the simulatneous administration of cortisone. Cortisone therapy must be carried out under clinical observation with control of the erythrocyte sedimentation reaction, to be able to halt the therapy in cases in which symptoms of aggravation are noted. The problem of the utilization of the modifications of the erythrocyte sedimentation reaction in the course of cortisone therapy as a test for the presence of the neoplastic process is discussed in detail."

121. Heavy Metal Content in Malignant Tissue

"Copper, Zinc, and Cadmium Content in the Organs of Rabbits Affected With Malignant Tumors," by V. I. Gorodyskiy and I. V. Veselaya, Kiev Scientific Research Roentgenoradiological and Oncological Institute; Moscow, Voprosy Meditsinskoy Khimii, Vol 6, No 2, Mar/Apr 60, 128-130

Rabbits were used in experiments carried out to determine the amount of copper, zinc, and cadmium which is contained in tumorous tissue of the lungs, liver, and kidneys, as compared with the content of these heavy metals in normal tissue. The experiments established that tumorous lung

tissue content of copper was 3.2, zinc, 3.2, and cadmium, 3.8 times that in normal lung tissue; tumorous tissue content of copper was 3.5, zinc, 6, and cadmium, 2.6 times that in normal liver tissue; tumorous kidney tissue content of copper was 1.6 zinc, 2.9, and cadmium, 2.1 times that in normal kidney tissue.

122. Mineral Metabolism of Malignant Tissues

"Trace Elements in Malignant Tumors According to Data From Spectral Analysis, by V. S. Zhdanova, Nauchn. Rabot Stud. Irkutskogo Med. In-ta (Scientific Works of the Students of Irkutsk Medical Institute), No 1, 1959, pp 106-108; (from Referativnyy Zhurnal Khimiya -- Biologicheskaya Khimiya, No 7, 10 Apr 60, Abstract No 9945, by M. Piotrovskiy)

"It was shown that the iron content in malignant hepatic tissue was only 1/85 that in normal hepatic tissue; that in malignant pulmonary tissue was only one tenth; and that in malignant bronchial tissue was only one third. The manganese content of malignant hepatic tissue was only 1/26 that in normal hepatic tissue; that in malignant pulmonary tissue was only one sixth; and that in bronchial tissue was decreased by a factor of 2.5. Nickel was not detected in malignant hepatic or bronchial tissues."

123. Antibiotic Therapy of Tumors

"Antitumor Antibiotic Preparations Isolated From Actinomycetes," by A. Joffe and G. Miskinute, Tr. In-ta Eksperim. Med. AN Lit SSR (Works of the Institute of Experimental Medicine, Academy of Sciences Lithuanian SSR), 1958, 4-5, 193-205 (from Referativnyy Zhurnal -- Biologiya, No 5, 25 Mar 60, Abstract No 27764, by N. A. Blyumberg)

"Tests have been conducted on 1,741 strains of actinomycetes obtained from 160 samples of soil from various parts of the Lithuanian SSR. Antiagonistic antomicrobic properties were established in 942 of the strains. Of 30 cultural fluids tested, 12 inhibited the growth of Ehrlich's cancer in mice by 12-38 percent; nine by 43-58 percent; six stimulated the growth of the tumors; three were found to be toxic. Tests conducted on 18 purified preparations disclosed that five arrested tumor growth by 66-91 percent; five by 43-52 percent; two by 20-29 percent; three were found to be toxic. The antibacterial and antitumor actions of the preparations frequently failed to coincide."

124. N. N. Blokhin Discusses Cancer Research

"Cancer: a Problem of World-Wide Significance," by Prof N. N. Blokhin, president of the Academy of Medical Sciences USSR; Moscow, Zdorov'ye, No 5, May 60, Moscow, p 3

This article is the reply that Prof N. N. Blokhin sent to the editorial office of the periodical Zdorov'ye when he was asked to comment on the appeal made by the Belorussian SSR delegation to the UN for greater world-wide cooperation in cancer research. The appeal was made at the 14th session of the General Assembly of the UN. Prof. N. N. Blokhin is the president of the Academy of Medical Sciences USSR and director of the Institute of Experimental and Clinical Oncology.

In his reply, Blokhin said that the diagnosis and treatment of malignant tumors is essentially an international problem. Almost 2 million inhabitants of the earth die of cancer every year. Nothing conclusive has yet been found to explain the causes of cancer and no effective drug for the treatment of a number of malignant tumors has yet been discovered. It is not correct to think that one specialist might stumble accidently on some method of treating cancer. The only way any progress can be made is through the combined efforts of scientists of many countries, who represent various branches of scientific knowledge, such as oncology, biochemistry, radiology, nuclear physics, electronics, etc.

Experience has shown that cancer usually attacks people over 40 years of age. Cancer has become the No 2 killer. Diseases of the cardiovascular system hold first place. The reason cancer has captured the second place as the killer is that people live longer now, the incidence of children's diseases has been sharply reduced, the plague, cholera and smallpox have been completely eradicated. These statements reflect mainly the conditions that exist in countries which are well-developed economically and culturally. The main problem that confronts the backward countries is the control of fatal contagious diseases.

It should be pointed out that climatic conditions, geographic zones, and living and working conditions play an important part in the incidence of cancer. At present, lung cancer accounts for the greatest percentage of the total of cancer incidence. Such is the case in England, France, and West Germany. Scientists believe that smoking and, to a greater extent, products of incompletely burned coal in the air are cancerogenic. Industrialization is not at fault here; the blame can be placed on the poor organization of industry, which makes no provision for elementary human health requirements.

Soviet oncologists are working together with hygienists in examining the air of cities to isolate and remove cancerogenic substances from the air. Blokhin referred to the new city of Agarsk. The city was built in such a manner that industrial establishments are separated from the housing area by a large area of vegetation. Examination of the air around Agarsk showed that it was free from Cancerogenic substances. Such an arrangement can be significant in preventing lung cancer.

Interest in cancer control is increasing every year. Governments of various countries and international organizations are beginning to be more and more interested in cancer research. Intensive research work is now going on in USSR, the US, England, France, and Japan. A number of effective drugs against definite forms of tumors are already being utilized in clinical practice. Surgery and subsequent radiotheraphy and chemotheraphy have produced encouraging results. Greater success may be achieved if all scientists pool their resources and work in close cooperation with each other.

The International Union of Cancer Control has been in existence for many years. This union periodically sponsors conferences at which specialists of various countries have an opportunity to report on results of their experiments. The World Health Organization is also doing great work.

Members of the medical profession were glad to hear that the 14th session of the General Assembly of the UN approved awards for outstanding work in cancer research. The association of scientists under the banner of such an organization as the UN will certainly result in greater progress.

Pharmacology and Toxicology

125. Pyridine Derivatives as Ganglioblocking Preparations

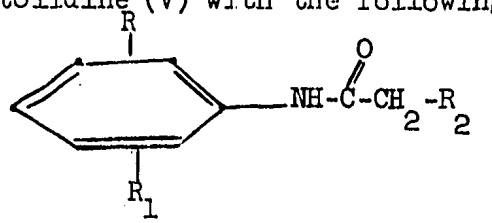
"Pharmacology of Certain Derivatives of Pyridine," by I. V. Komissarov, Materialy Nauchn. Sessii, Posvyashch. 40-letiyu BSSR (Data of the Scientific Conference Dedicated to the 40th Anniversary of the Belorussian SSR), Minsk, 1958, 118-120 (from Referativnyy Zhurnal--Biologiya, No 7, 10 Apr 60, Abstract No 32759, by S. T. Skorodelov)

"Acute experiments carried out on dogs revealed that the iodomethylate of the diethyl ester of beta-(pyridil-2)-ethylmalonic acid; the diiodomethylates of 2-dimethylaminoethyl-5-ethylpyridine, 2-diethylaminoethyl-5-ethylpyridine, and 2-(N-piperridyl)-ethyl-5-ethylpyridine may be of considerable interest as possible ganglioblocking and atropinelike preparations, as well as respiratory stimulants."

126. Properties of Some Alkylaminoacetyl Derivatives

"Comparative Pharmacological Characteristics of Certain Alkylaminoacetyl Derivatives," by P. Ye. Motovilov, Yezhegodnik. In-t Eksperim. Med. AMN SSSR (Yearbook of the Institute of Ekperimental Medicine, Academy of Medical Sciences USSR), 1957, L., 1958, 180-188 (from Referativnyy Zhurnal -- Biologiya, No 7, 10 Apr 60, Abstract No 32757, by V. S. Shashkov)

"Investigations were conducted of 35 derivatives of aniline (I), ortho- and paratoluidines (II), 2,4- and 2,6-xylidines (III), paranitroaniline, paraphenylenediamine, dimethylparaphenylenediamine, benzidine (IV), and orthotolidine (V) with the following general formula:



in which R= R_1=CH_3 ; $N(CH_3)_2$; NH_2 ; NO_2 ; R_2=$N(C_2H_5)_2$; NC_5H_{10}, their hydrochlorides with tertiary nitrogen in the amino group, and the iodomethylates with quaternary nitrogen. Derivatives of (I) when subcutaneously administered in the form of a two percent solution have a local anesthetic effect of brief duration (5-10 minutes). The duration of the effect of (II) is 5-15 minutes, and that of (III) is 20-70 minutes. The local anesthesizing effect of the compounds was enhanced when the molecules were 'coupled.' Iodomethylation reduced, and in the derivatives of (IV) and (V) removed the local anesthesizing effect producing a blocking action on the ganglia and neuromuscular synapses. Xycaine (analogue of xylocaine) has been found to have the best anesthesizing effect. The ganglioblocking properties and toxicity increased with transition from tertiary to quaternary compounds. The rapidity with which the inclusion of S^{35} methionine into the proteins of the epithelium of rate takes place under the effect of surface anesthesia caused by cocaine and xycaine is diminished."

127. Properties of Isomers of Alphaphenylethylamines

"Pharmacology of Optical Isomers of Alphaphenylethylamines," by T. Yu. Al'yuchenok and K. S. Shadurskiy, Materialy Nauchn. Sessii Posvyashch. 40-letiyu BSSR (Data on the Scientific Conference Dedicated to the 40th anniversary of the Belorussian SSR), Minsk, 1958, 91-92 (from Referativnyy Zhurnal -- Biologiya, No 7, 10 Apr 60, Abstract No 32756, by B. A. Katsnel'son)

"L-alphaphenylethylamine (I), d-alphaphenylethylamine (II), dl-alphaphenylethylamine (III) when administered to mice intraperitoneally produced intoxication which was characterized by a monotypical clinical

picture (adynamia, tremors, ataxia 3-4 minutes after the administration of the preparations; clonicotonic convusliosn 8-10 minutes after the administration of the preparations; lateral position which continued for a period of 15-40 minutes; and death caused by respiratory paralysis which preceded cardiac failure by 1.5-2.5 minutes. (I) was found to be the more toxic of the preparations on the basis of the maximally tolerated dose (200 milligrams per kilogram of body weight against 300 milligrams for (II) and 325 milligrams per kilogram of body weight for (III)); (III) was found to the more toxic on the DL_{100} basis (375 milligrams per kilogram of body weight against 400 milligrams per kilogram body weight for (I) and (II)). In dilution of 1:50,000 the three isomers exhibited a vaso-constricting effect, with (I) possessing the greater part of this action. In dilutions of 1:25,000 the three isomers increased the tonus and reduced the amplitude of peristlasis of an isolated intestinal ansa. When intravenously administered to anesthesized dogs in doses of 70 milligrams per kilogram of body weight the preparations exhibited hypotensive action, thd duration and depth of which diminished in the following order of the preparations: (II). (III). (I)."

128. Effect of Phenoxydiethylaminopropanol Derivatives on Organism

"Concerning Some of the Pharmacological Properties of Phenoxydiethylaminopropanol Derivatives," by L. A. Yakimovich and I. I. Chizhevskaya, Materialy Nauchn. Sessii Posvyashch. 40-letiyu BSSR (Data on the Scientific Session Dedicated to the 40th anniversary of the Belorussian SSR), Minsk, 1958, 287-288 (from Referativnyy Zhurnal -- Biologiya, No 7, 10 Apr 60, Abstract No 32758, by S. T. Skorodelov)

"In experiments on mice and rabbits it was established that the iodoethylates of phenoxydiethylaminopropanol when introduced into the stomach are more active as hypotensives and are less toxic than are their hydrochlorides. The most effective of these is 'AI2' (containing pentavalent nitrogen). Its hypotensive effect in rabbits (60 milligrams per kilogram of body weight) continues for about 3 hours and 15 minutes. The possibility of the clinical investigation of the preparation for internal use as a vasodilating agent is discussed."

129. Zirconium Toxicity Commensurate With Its Solubility

"A Study of the Toxicity of Zirconium and Its Compounds Which Are Used in Modern Industry," by O. Ya. Mogilevskaya, First Moscow Order of Lenin Medical Institute imeni I. M. Sechenov; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 6, Jun 60, pp 27-31

The purpose of the research described was to study the effect of zirconium and its compounds when introduced into experimental animals (rats) by various pathways. The author presents the following conclusions:

"1. The aerosol of metallic zirconium and of zirconium dioxide does not possess any toxic effect, but does cause an indistinct and slowly progressing fibrous process in the lungs.

"2. The soluble salts of zirconium (zirconium chloride, zirconium sulfate, and zirconium nitrate) are acutely aggressive aerosols which injure the tissue at the site of their introduction into the organism, and exert a general toxic effect.

"3. The intensity and the nature of the effectof zirconium compounds depend on the structure of the molecule which contains the metal, and on the solubility of the compound.

"4. People working and coming in contact with zirconium compounds should exercise great caution and have medical check-ups at least once a year."

130. Thorium Intoxication Similar to Radiation Sickness in Animals

"The Problem of Thorium Toxicity," by N. Yu. Tarasenko; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 6, Jun 60, pp 21-27

The purpose of the research described was to study the toxic effects of metallic thorium and its insoluble fluoride salt on animals. Tests were conducted on rats subjected to a single intratracheal administration of metallic thorium and thorium fluoride amounting to 65 mg/kg body weight with an alpha-activity equal to 1.56×10^{-8} curies; and on rabbits subjected to repeated peroral administration of thorium fluoride for a period of 10 days to 28 months.

Data presented in the article reveal the general condition of the animals, changes in weight, hemodynamic shifts, and certain pathological-anatomic and histologic changes.

The author presents the following conclusions:

"1. Thorium and its insoluble compounds administered to animals via the pulmonary and gastrointestinal tracts induce changes which are similar to those observed in radiation sickness.

"2. Thorium administered to rats intratracheally is retained in the organism for long periods, especially in the lungs, lymph glands, and bone tissue.

"3. The effect of thorium on an organism is accompanied by a series of functional and organic changes. Sharp vascular disturbances are detected in the internal organs and the nervous system. The nature of the morphological changes, except at the site at which the substances are administered by various methods, are identical. The extent to which these changes are manifested depends on the duration of the life of the animal. The special changes occurring in the lungs in the form of nodules of pneumoconiosis following the intratracheal administration of thorium should be noted.

"4. In addition to definite, diffused injury to all the systems and organs due to the effect of thorium, more profound local changes of a destructive and dystrophic nature appear in the lungs, brain, liver, and kidneys.

"5. The administration of pure metallic thorium via the lungs causes, due to its protracted retention, changes in the kidneys, lungs, liver, and the nervous system which are similar to those observed due to the administration of the insoluble fluoride salt. It is evident that the pathological changes which are observed are based on the effect of thorium."

131. Prolonged Anesthesia Caused by Drug Combinations

"On the Pharmacology of Sodium Dimethyldithiocarbamate," by M. V. Korablev, Chair of Pharmacology, Voronezh State Medical Institute; Moscow, Farmakologiya i Toksikologiya, Mar/Apr 60, pp 161-166

In recent years the sodium salt and other salts of dithiocarbamic acid have been widely used in agriculture as seed fungicides and mordants. Despite their wide use there has not been any study conducted on their effect on the organism of man and animals. Consequently, the authors studied the general activity and toxicity of the sodium salt, its effect on the activity of hypnotic and anesthetic agents, and also its effect on the peripheral blood and blood-forming organs (bone marrow).

When a single dose of sodium dimethyldithiocarbamate (DMDC) is introduced into the stomach, the LD_{50} for mice equals 1.6 g/kg, and for rats, 2.1 g/kg. In experiments on mice this drug prolongs the anesthetic effect of chloralhydrate from 107 to 900 minutes, or urethane from 517 to 954 minutes, and of barbamyl from 164 to 752 minutes. A combination of sodium dimethyldithiocarbamate with chloralhydate and urethane is fatal to 60-70% of the animals.

Multiple intravenous administration of DMDC to rabbits in a dose of 80 mg/kg provokes leucopenia, the development of which is due to inhibited myeloblastic hemopoiesis. In the instances of accidental DMDC poisioning, one should abstain form prescribing urethane, chloralhydrate, and barbamyl.

The potentiation effect of DMDC with respect to barbamyl might possibly be made use of under clinical conditions for prolonging the state of anesthesia and in narcosis therapy.

132. Attempt to Reduce Toxicity of Anabasine

"Synthetic Analgesics," by Yu. V. Svetkin and Ya. Kamenshchik, Bashkir State University; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 5, May 60, pp 1714-1715

Although anabasine exhibits a high physiological activity, its use in pharmacological practice is very difficult in view of its high toxicity. The authors assumed that attempts to reduce its toxicity should be directed at decreasing the mobility of the noncovalent pair of electrons at the nitrogen atom (by an exchange reaction in the NH group: acetylation, alkylation, acylamidation, etc.). In this report they describe the condensation of anabasine with chloracetanilide which led to the formation of the anilide of anabasylacetic acid.

Physiology

133. Vibration Sickness Studies

"Diagnostic Significance of Investigations Into Vibration Sensibility During Vibration Disease," by N. B. Metlina, Institute of Industrial Hygiene and Occupational Diseases, Academy of Medical Sciences USSR; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 5, May 60, pp 45-48

Vibration, an adequate stimulant for the vibration analysor, often causes changes in its excitability which are accompanied by alterations of sensibility to vibration. A new device for measuring vibration

sensibility, called the electronic pallesthesiometer, permits inquiry into both the threshold and the differentiation of vibration sensibility, on one hand, and the time required for its restoration, on the other.

Studies conducted on 180 workers exposed to the high-frequency vibration of pneumatic hammers, and on a group of people suffering from vibration sickness, indicated frequent diminution of sensibility to vibration of varying degrees. The incidence of such diminution and the degree of inhibition are both ordinarily dependent on the parameters of the vibration and the past work record of the operator. In this connection, it should be noted that disturbed sensibility to vibration can be observed quite often in practically healthy people who do not show any other symptoms characteristic of the effect produced by vibration. The degree of disturbance in vibration sensibility depends on the intensity of the vibration sickness. A complete inhibition of vibration sensibility can be noted in advanced cases. Investigation of the inhibition of vibration sensibility by the use of the vibration test method can reveal considerable prolongation of the period required for the recovery of this function. These data provide evidence that, along with the impairment of peripheral portions of the vibration analysor, functional alterations also occur at the central end of the vibration analysor where the fatigue is at its highest.

The disturbed sensibility to vibration becomes normal with the reverse development of vibration sickness. In well-advanced forms, where the process is irreversible, the changes in the sensibility to vibration become rather stable. The proposed investigations may be used for an early diagnosis.

134. Clinical Data on Vibration Sickness

"Clinical Study of a Singular Form of Vibration Disease," by A. S. Mel'kumova, Institute of Sanitation and Hygiene imeni F. F. Erisman; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 5, May 60, pp 41-45

This article discusses data collected during the course of 2-year study of the general health of several hundred workers exposed to total vibration during nonmechanized leveling of concrete on vibration stands. A peculiar form of vibration disease characterized by microfocal manifestations of nervous system impairment was noted.

135. Effect of Vibration on Sonic Tone Perception

"The Effect of Vibrations of Differnt Parameters on the Threshold Perception of Sonic Tones," by Z. M. Butkovskaya; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 5, May 60, pp 12-16

The author of the article describes experiments which were conducted to determine the influence of vibration with frequencies of 30 and 50 hertz and amplitudes of 0.4 and 0.2 millimeters on the threshold perception of sonic tones.

The method of tonal audiometry was used to determine the threshold characteristics of the air conductivity of vibrations when frequencies of 1,000, 2,000, 4,000, 8,000, 500, 250, and 125 hertz were used. It was found that vertical vibration of 30 and 50 hertz and an amplitude of 0.4 millimeter, lasting 10 minutes, tended to raise the sonic threshold at frequencies of 125, 250, and 4,000 to 8,000 hertz. Threshold increase was noted also at frequencies of 500, 1,000, and 2,000 hertz, although instances of decrease were also noted. No changes occurred at the frequency of 500 hertz. Vibration frequencies of 30 and 50 hertz and an amplitude of 0.2 millimeter had no effect on tone perception.

Public Health, Hygiene, and Sanitation

136. Improvement of Public Health Service Urged

"Problems in Nutrition in the Light of the Resolution Adopted by the Central Committee CPSU and the Council of Ministers USSR 'On Measures for the Further Improvement of Medical Service and Public Health Protection in the USSR'" (unsigned article); Moscow, Voprosy Pitaniya, Vol 19, No 3, May Jun 60, pp 3-6

This article states that the resolution of the Central Committee CPSU and the Council of Ministers USSR once more proves that the Communist Party and the Soviet government are very much interested in the welfare and health of the Soviet people. A large amount of money, made available as a result of the reduction of the Soviet Armed Forces, is being used to raise the living standards of the population and to improve medical service.

The material and cultural level of the Soviet population is higher now than it was before the Soviets gained control of the government. The morbidity rate is much lower now than it was before the revolution. Overall mortality is only one Fourth that in tsarist times and child mortality is about one seventh the previous level. The average life span double what it was before.

The resolution of the Central Committee CPSU and the Council of Ministers USSR noted, however, that the organization of medical service to the population is lagging in areas where new industries have been established, in areas where virgin soil and wastelands are being reclaimed, and in areas of the Far North and in mountainous regions. The Academy of Medical Sciences USSR, scientific research establishments, and medical intitutes are not making a great enough effort to reduce the incidence of communicable diseases. New medical discoveries are not being put to use fast enough, and new achievements in biology, physics, chemistry, and radiology are not being utilized fully.

It is expected that, after the Seven-Year Plan is fulfilled, the number of hospital beds in the country will increase from 1,532,600 to 2,148,600, the number of medical establishments will increase considerably and their equipment will be improved. This will require additional appropriations. The medical industry has been called on to produce 3.5 times as many medical preparations, medical instruments and other medical equipment. Therapeutic and preventive medical establishments are expected to be well supplied with up-to-date medical preparations and equipment, including electronic devices and antibiotics.

A training program has been formulated for medical personnel undergoing advanced study. It is an improvement over the previous program.

The resolution of the Central Committee CPSU and the Council of Ministers USSR called on medical scientists and medical practitioners to intensify their efforts toward the complete eradication of such communicable diseases as diphtheria, tularemia, and poliomyelitis, and to find ways of effectively treating and preventing influenza, angina, measles, intestinal infections, and other diseases. The resolution appealed for continued effort to reduce child mortality, to preserve the health of mothers and children, and to intensify the search for methods and drugs to prevent cardiovascular diseases. The search for causes of cancer and other malignant tumors must be continued.

The resolution placed great emphasis on the development of various types of diet. Proper nutrition is important for preserving health and for prolonging life. Studies must be conducted on proper diet for both the healthy and the morbid organism, for infants and for old people, for people doing sedentary work and for people whose jobs require physical exertion, for people living in areas where the climate is severe and for people who live in temperate zones, for pregnant women, and for the newly born.

It is the duty of Soviet scientists to propagandize scientific progress made in the field of nutrition. This is necessary because proper nutrition can assure the builders of Communism in the Soviet Union lasting good health and a long, happy life.

137. Health Care Efforts of Soviet Government

"New Evidence of the Concern of the Party and Government for the People's Health," by P. Ponomareva; Moscow, Pediatriya, No 5, May 60, pp 3-6

The author says that two major events occurred early in 1960. The first was that the Supreme Soviet USSR approved a large additional reduction of the Armed Forces of the USSR and the second was a decree of the Central Committee CPSU and the Council of Ministers USSR dealing with measures for the further improvement of medical aid to the Soviet people.

Resources made available as a result of the cut in the Armed Forces will be used to expand construction of therapeutic and preventive medical establishments, increase the manufacture of medical equipment and drugs, and improve scientific research and sanitary conditions in urban and rural communities.

The Communist Party has always shown great interest in child welfare. Child mortality is only about one seventh what it was before the revolution. The decree of the Central Committee CPSU and the Council of Ministers USSR calls for further decreasing child morbidity and mortality.

The outpatient clinic is the principal link in the chain of establishments for the protection of children's health. The outpatient clinics and the medical district establishments have been playing a great role in raising the quality of specialized medical aid to children. House visits and medical aid at home has been expanded.

The decree of the Central Committee CPSU and the Council of Ministers USSR states that greater effort must be made to control communicable diseases and the search for drugs which could prevent incidence of influenza and catarrhs of the upper respiratory tracts must be intensified. Particularly great attention is expected to be given to the study of that group of infections to which infants are susceptible during the first few months of their lives. Interstitial pneumonia belongs to this group of infections.

Conditions now exist for the complete eradication of such infections as diphtheria, tularemia, poliomyelitis, malaria, and a few others, and for a sharp reduction of the incidence of whooping cough, typhoid, acute enteric infections, and ascariasis.

Successful mass immunization of the Soviet population against poliomyelitis with live virus polio vaccine produced from attenuated strains is of international significance. It has been proved that peroral immunization with live virus polio vaccine is harmless and is well tolerated. A possibility exists for the complete eradication of poliomyelitis in the USSR.

Results of studies of the effectiveness of whooping cough and whooping cough-diphtheria vaccines showed that the incidence of whooping cough, among children who have been vaccinated is only one fifth that among those who have not been vaccinated. Studies are being continued to improve that vaccine.

New methods for rational therapy of dysentery and other enteric infections have been discovered. These methods involve the use of such antibiotics as colimycin and mycerin.

The eradication of communicable diseases is a national problem and must concern not only epidemiologists, microbiologists, and clinicians, but also pharmacologists, biochemists, and immunologists.

The network of medical establishments that serve women and children has been expanded. The number of maternity homes also has been increased during the past year. There were 380,000 more spaces available in nurseries and kindergartens at the end of 1959 than at the end of 1958. Almost 7 million children have spent their vacations in Pioneer camps and sanatoriums for children during 1959.

The decree of the Central Committee CPSU and the Council of Ministers USSR stressed the need for pediatricians to further improve medical service to children.

138. Problems of Otorhinolaryngology

"Fulfillment of the Assignment of the Party and Government" (unsigned article); Moscow, Vestnik Otorino-Laringologii, Vol 22, No 3, May/Jun 60, pp 3-5

This article discusses the resolution adopted by the Central Committee CPSU and the Council of Ministers USSR which deals with further improvement in medical service and public health protection in the USSR. Significant reduction in the Armed Forces has made it possible to divert additional resources to the health protection of the population. Otolaryngologists are responsible for using the funds allocated to them to further scientific research. Additional funds should help to promote investigation of the causes of various diseases and intensify the search for effective means of preventing and treating those diseases which affect a large number of people. These diseases are influenza, angina, cancer, malignant tumors, and a few other diseases which are of immediate interest to otolaryngologists. Otolaryngologists have not yet taken an active part in attempts to devise measures for preventing a high incidence of influenza and complications caused by influenza. The incidence of angina among workers in industrial establishments is still high.

Oncology is a big problem for the entire medical profession. The functional and anatomic-topographical peculiarities of otorhinolaryngological organs, however, offer a number of possibilities which may result in the solution of many problems of interest to members of all branches of the medical profession.

Aid to oncological patients is given only in large cities. But even there oncological infections are not always diagnosed rapidly enough and there are not many places which can combine radiation and surgical treatment.

In 1958 there were 1,532,600 hospital beds available in the USSR, it is expected that there will be 2,148,600 available in 1965. Outpatient sections of hospitals and medical aid posts in industrial establishments will also be expanded. Therapeutic and preventive medical establishments will be supplied with modern equipment and instruments. Diagnostic laboratories, roentgen, and physiotherapeutic units will also be expanded.

The system of advanced training for medical personnel will be improved to raise the qualifications of physicians without leave of absence from their work.

The Central Committee CPSU and the Council of Ministers USSR approved the expenditure of 1.8 billion rubles, in addition to funds already allocated, for construction, during 1961-1965, of public health establishments, medical industrial establishments, scientific research institutes, experimental plants, and pharmacies and pharmaceutical warehouses.

The problem commission on otorhinolaryngology, Academy of Medical Sciences USSR, must assume leadership in solving problems of primary importance. These problems concern angina and chronic tonsillitis, chronic suppurative otitis and its complications, the physiology and pathology of the acoustic analysor and voice, occupational diseases and trauma in otorhinolaryngology, and oncology in otorhinolaryngology. Scientific research institutes must contribute greatly to the solution of these problems.

Otorhinolaryngologists of the USSR and of the union republics have been called on to coordinate their scientific research. It is of the utmost importance that therapeutic establishments be supplied with audiometers and other modern equipment. The All-Union medical Society of Otorhinolaryngologists and the All-Union Deaf-Mute Society of must launch a program of training specialists in the manufacture of miniature hearing aids and must make attempts to increase the number of hearing aid repair shops.

139. New Work Schedules for Riveters Investigated

"A Work Schedule for Riveters in the Aviation Industry," by T. N. Pavlova, Institute of Industrial Hygiene and Occupational Diseases, Academy of Medical Sciences USSR; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 5, May 60, pp 31-36

The author of this article states that a comparative study was undertaken to investigate the work schedule adopted for riveters employed in the aviation industry (an 8-hour workday with a one hour dinner interval in the middle) and to investigate an experimental schedule providing for four supplementary intervals in the course of the day at the expense of

work hours. This study proved that the inclusion of supplementary intervals tends to reduce unfavorable physiological changes occurring in the organism, and contributes to a higher working capacity.

Shorter working hours for riveters and the introduction of additional rest periods during the regular workday have been recommended for those who use pneumatic percussion tools in the aviation industry. This is in addition to improved working conditions, replacement of riveting equipment, and broader mechanization of operations for this occupational group.

140. Lenin's Legacy

"To Live up to Lenin's Expectations" (unsigned article); Moscow, Sovetskoye Zdravookhraneniye, No 4, 1960, pp 3-5

This article notes that 22 April 1960 marked the 90th anniversary of the birth of V. I. Lenin. It says that this is the day when workers of the entire world recall the life and work of a man whose name has become associated with the abolition of exploitation of man by man and with the building of a society in which workers have a real opportunity for all-around physical and spiritual development. The people of the Soviet Union will remember this day with a feeling of profound love and gratitude toward their teacher and leader, the founder of the Communist Party and the first Soviet socialist state in the world.

On the eve of his revolutionary activity, V. I. Lenin wrote the following: "...give us an organization of revolutionaries and we will turn Russia inside out!" Organized by V. I. Lenin and hardened by its struggle against its many enemies, this organization of revolutionaries, the CPSU, has grown into a mighty force, guiding a multitude of Soviet people in their effort to build a classless society. In his theoretical writings on state and government. Lenin consistently stressed the need for demolishing the old bourgeois state machine and for organizing a new government apparatus with a goal to completely liberate the working class from the capitalist yoke.

V. I. Lenin said that the dictatorship of the proletariat is the highest form of democracy, radically different from the hypocritical and false democracy of the wealthy, exploiting minority. Lenin had in view a proletarian democracy in which control of the government would be in the hands of workers of a multinational Soviet Union. Relations between nationalities have improved and great progress has been made in economics, science, and culture in the Soviet Union. All this has been accomplished under the leadership of the CPSU.

Having organized the Communist Party and the Soviet government, V. I. Lenin evolved theoretical bases for the formation of a system of public health service which is socialist in content.

In his article "The Significance of Militant Materialism," published in 1922, Lenin wrote that while science is making great progress and the class struggle is acute, a philosophical foundation will remain a necessity. Natural science could not withstand the pressure of bourgeois ideas and the bourgeois world outlook without a philosophical foundation. A natural scientist must be a dialectic materialist. Lenin restated this argument in his classic Materialism and Empiriocriticism.

V. I. Lenin advised all Marxists to screen all reactionary tendencies and to fight resolutely against class theories of society.

When V. I. Lenin was the head of the Soviet state, he contributed greatly to the organization of the Soviet health service. He laid the groundwork for scientific progress and for extensive measures for the protection of mothers, children, and adolescents. He was responsible for the organization of health resorts, the epidemic control service, and advocated free, qualified medical aid to all.

Soviet health service has progressed far in its endeavor to protect the health of the Soviet population. Soviet medical workers can look forward to greater accomplishments if they continue to live up to Lenin's behests and to continue to follow the sage guidance of the CPSU.

Radiology

141. Harmful Ozone and Nitrogen Oxides Formed Around Powerful Gamma Installation

"The Formation of Ozone and Nitrogen Oxides Due to the Effect of Gamma-Irradiation During the Operation of a Powerful Gamma Installation," by V. F. Oreshko and N. F. Tsikhmistrenko, Scientific Research Institute of Sanitation and Hygiene imeni F F. Erisman; Moscow, Gigiyena Truda i Professional'niye Zabolevaniya, No 6, Jun 60, pp 16-20

The purpose of the research described was to define the sanitary and hygienic working conditions in installations equipped with powerful sources of ionizing radiations, in this case an exposed source of C_o^{60} with a total active emission of 21,000 gram equivalents of radium.

The article describes the placement and screening of the chamber containing the source and lists the concentration levels of O_3, NO_2, and HNO_3 at various distances and heights around the source, in the corridors, and at other points, and how these concentrations change with time through oxidation.

These studies show that harmful products (ozone and nitrogen oxides) are formed in the chamber of the ionization source and that they exceed the maximum permissible limits whenever the source operates continuously for any significant length of time. During the operating time, the maximum content of radiolytic products was observed close to the source at a height of 1.5 meters.

142. Combined Radiation and Uterus Denervation Effects on Embryonic Development

"X-Ray Effects on the Development of Rat Embryos Growing in a Denervated Uterus," by N. A. Samoshkina, Laboratory of Embryology, Institute of Experimental Medicine, Academy of Medical Sciences USSR; Moscow, Arkhiv Anatomii, Gistologii i Embriologii, Vol 38, No 3, Mar 60, pp 53-62

The research described is a study of the combined effects of uterus denervation and radiation on the development of rat embryos.

The author presents the following conclusions

1. Uterus denervation before pregnancy does not alter radiation action. The data obtained on implantations and on the number of normal, abnormal, and dead embryos under these experimental conditions did not differ from control figures.

2. Uterus denervation performed on the first day of pregnancy without the additional effect of radiation exerted a noticeable effect on implantations and on the development of the embryos: it significantly decreased the percentage of implantations as compared with the control, and also decreased the number of normally developing embryos.

3. The combined effect of uterus denervation on the first day of pregnancy plus the irradiation of the rats by 200 r on the 4th day of pregnancy led to the intensification of radiation effects, which were expressed by an increased number of abnormal embryos to the 10th day of development. It may be presumed that the effect of the maternal nervous system alleviates indirect radiation action or embryonic development.

4. Laparotomy without uterus denervation, performed on the first day of pregnancy and combined with radiation action on the 4th day of pregnancy, also significantly aggravated radiation effects but to a lesser degree than denervation.

143. Improved Safe for Storage of Radioactive Substances Described

"Protective Safe for the Storage of Radioactive Preparations," by A. A. Stankevich, Chair of Oncology of Giduv imeni S. M Kirov, and the Radium Laboratory, Institute of Oncology, Academy of Medical Sciences USSR; Moscow, Voprosy Onkologii, Vol 6, No 4, Apr 60, pp 79-81

The author describes a safe designed by the Experimental Workshops of GIDUV (Gosudarstvenniy Institutdlya Usovershenstvovariya Vrachey, State Institute for the Advanced Training of Physicians) for the storage of various radioactive preparations. The safe is simply constructed; it is effective and convenient to work with. It consists of 16 separate compartments arranged in four parallel layers of shelves. Each separate compartment contains a box (7 cm thick in front, 3 cm thick on the sides and at the bottom, and 2 cm thick at the back), and is supplied with a long handle to remove the radioactive preparations from the safe. To further minimize the radiation hazards to personnel, the doors of only four boxes slide open at any one time.

The safe is made of steel, and is placed in a 50-cm-thick concrete chamber, 120 cm above the floor. Various radioactive preparations with a total activity from Co^{60} amounting to 1.5 g equivalents of radium can be stored in it. When the safe contains this amount of radioactive material, the intensity of radiation around it is as follows: at the walls of the safe, one milli r/ hour; at 0.5 meter, 0.6-0.8 milli r/ hour; at one meter, 0.5 milli r/ hour; and at a distance of 2.5 meters the radiation is below the sensitivity of the apparatus.

The test is accompanied by several diagrams.

Surgery

144. Hungarian Blood Supply Service Used by Pharamaceutical Industry

"Healing Human Blood -- 32 Medicines Are Prepared From Blood," by Rozsa Feher; Budapest, Magyar Nemzet, 19 Jun 60, p 3

According to a recent article in a Hungarian daily paper, the number of Hungarian blood donors has grown to 60,000 in 10 years. The various Hungarian treatment institutes need 60,000 liters of blood per year. Processing one liter of blood for tranfusion costs 800-1,000 forints. The patient receives the blood free of charge.

In addition to its use for transfusions, 32 medicines are prepared from human blood, including gamma globulin and blood plasma. Most of the medicines are prepared by the Central Research Institute (Kozponti Kutato Intezet) of the National Blood Supply Service (Orszagos Verellato Szolgalat). Thrombin and fibrin preparations are used in traumatology and surgery. Films, bioplasts, nails, tubes, and cups are formed from blood fibrin for surgical use.

Virology

145. Clinical Study of Poliomyelitis

"Experience in Clinical-Virological Parallels in Cases of Acute Poliomyelitis," by R. M. Pratusevich and A. A. Roshteyn, Scientific Research Pediatrics Institute and Institute of Epidemiology, Microbiology, and Hygiene imeni Pasteur; Moscow, Pediatriya, No 5, May 60, pp 16-20

This article offers some clinical-virological comparisons from investigations of patients with diseases diagnosed as poliomyelitis. Results of studies conducted on children up to 15 years of age showed that the frequency of virus isolation in paralytic (spinal) and nonparalytic forms differs only insignificantly. In contrast to the above, the virus was isolated very rarely (in 4.7% of cases) in older patients affected with isolated facial nerve paresis (the so-called pontine form). Virological investigations made it possible to establish, in a number of instances, the etiology of abortive and atypical forms of poliomyelitis as well as of some sporadic and focal affections with serous meningitis.

Miscellaneous

146. Cybernetics Aids Medical Studies

"Electronics for the Doctor" (unsigned article); Berlin, Die Volksarmee, 7 Apr 60

"Soviet scientists have developed a 'cybernetic method' for medical studies of particularly complex nerve functions. Psychophysiologists S. M. Braines and A. W. Napalkov, in cooperation with Engr J. A. Schraider, have made significant observations of animals which have developed a conditioned reflex as well as the pattern of their subsequent behavior. The scientists have attempted to obtain a mathematical generalization of this process and to draw basic conclusions there from which will be helpful in the construction of new electronic computing and logarithmic machines.

"An electronic computer for the diagnosis of diseases is of great interest. It consists of a diagnostic electronic apparatus which makes it possible to determine 96 different diseases by a combination of symptoms. All symptoms have numbers which are entered on a control desk. By pressing the corresponding keys, the physician feeds a problem into the machine. The apparatus works with lightning speed and sorts up to 10,000 variations per second in its electronic 'brain.' Once the most precise diagnosis has been selected, the corresponding designation appears on a screen."

147. Evolution of Higher Nervous Activity

"Significance of Charles Darwin's Evolutionary Theory for the Physicology of Higher Nervous Activity, " by L. G. Voronin; Moscow, Zhurnal Vysshey Nervnoy Deyatel'nosti, No 6, Nov/Dec 59, pp 799-806

This article says that Charles Darwin's theory of evolution revolutionized thinking in the natural and social sciences. He evolved an orderly, materialistic theory, explaining in general terms the course of the historical development of organisms and the forces responsible for this development. This replaced the idealistic concept of the divine origin of life on earth, of the dissociation of the animate and inanimate nature, and the absence of the dependence of the development of organisms on the conditions under which they exist.

Darwin pointed out that a rich organic world developed as a result of variations, inheritance, the struggle for existence, and natural selection. This organic world developed from primitive noncellular forms of organisms to higher forms of life, including man. This theory became the symbol of progressive biology despite strong objections of idealistically thinking naturalists and representatives of the church.

Darwin's theory served as one of essential sicentific prerequisites for the subsequent materialistic theory of I. P. Pavlov concerning higher nervous activity. The study of brain physiology could not have emerged without the evolutionary theory and could not have been developed without morphology and the other fields of knowledge dealing with the structure and function of human and animal organisms.

Even though Darwin wrote more than 70 years before Pavlov developed his theory of two signal systems, it is evident from his writings that he understood the qualitative difference between the "Mental activity" in humans and in animals. In describing the behavior of animals, Darwin anticipated many of the principal aspects of the theory of conditioned reflexes. He observed that habits and instincts have a chain reaction characteristic.

Physiology was not in a very advantageous position for a long time because little attention was paid to the study of the evolution of functions. Thanks to I. M. Sechenov, Ye. N. Vvedenskiy, I. P. Pavlov, and L. A. Orbeli, this attitude toward evolutionary theory changed drastically.

In analyzing the behavior of animals, Darwin felt that there is a great gap in science. He had to operate not by means of physiological factors, but with the aid of psychological concepts, not always to his satisfaction. For example, in discussing expressions of emotion in animals and humans, he found them to be not only interesting, but also needing "further study by some gifted physiologist."

This study was begun by I. M. Sechenov 6 years before Charles Darwin's work was published. The results of Sechenov's investigations, entitled "The Manifestation of Emotions in Humans and Animals," were published at that time.

The physiological study of animal behavior interested Darwin and led to the founding of a new branch of knowledge: the physiology of the higher nervous activity. This branch of knowledge was the first to show scientifically the similarities and differences between the "mental activity" of humans and the "mental activity" of animals, and showed that the development of higher "mental functions" is the result of interaction between the organism and the conditions under which it exists. Results of physiological studies also showed that human behavior and animal behavior are the result of a complex interaction between innate and acquired reactions, that interactions bear various qualitative characteristics at various stages of the development of individuals, and that the role of acquired reactions increases during the life of an individual, depending on the degree of development of his nervous system. This is evident in the higher nervous activity of humans and animals, which is based on specific adaptive mechanisms in the form of a highly developed first signal system common to both, and a second signal system inherent in humans.

Thus, the physiological theory of I. P. Pavlov, based on the evolutionary theory and dialectic materialism, contributed to the development of the Darwinian theory.

A new scientific study was conceived and developed in the USSR under the influence of the theory and teachings of I. P. Pavlov concerning higher nervous activity, and as a result of the experiments of L. A. Orbeli and his associates. This new scientific study is known as evolutionary physiology. Evolutionary physiology, according to Orbeli, is confronted by two main tasks: an examination of each function under study from the standpoint of the history of its formation, on one hand, and, on the other hand, the "verification of evolutionary theory on the basis of physiological surveys."

Thus, the application of evolutionary principles in physiology makes it possible to understand the phylogenesis of various functions and to observe the history of their emergence.

Utilizing this principle of research, L. A. Orbeli revealed the adaptive and trophic role of the autonomic nervous system, the conditions of the interaction of afferent systems, the mechanisms of nervous regulation of contracting tissues at various levels of phylogenesis, and some phases of the interaction of the cerebrum, hypothalamus, and cerebellum.

According to Orbeli, the primitive functions and their coordinated relationships, arising somewhere in the evolutionary process, may not be eliminated during subsequent phylogenesis, but may become inhibited by more highly developed functions. In connection with the subject of this article, studies of the phylogenesis and ontogenesis of conditioned and unconditioned reflex reactions in animals at various stages of development, conducted in the laboratory of L. A. Orbeli, are of particular significance.

The following persons have been conducting studies of the comparative physiology of higher nervous activity: B. I. Bayandurov, D. A. Biryukov, L. G. Voronin, A. B. Kogan, A. D. Slonim, and others.

The question of how the acquired reactions which form an instinct are inherited has not yet been solved. I. P. Pavlov considered reflexes as individual adaptive phenomena, quite plastic, and existing as long as the conditions responsible for their formation are present. Being a proponent of evolutionary theory, he thought that some conditioned reflexes may be strengthened by heredity provided the conditions under which an organism exists remain constant. He changed his viewpoint after experimenting with elementary alimentary conditioned reflexes in mice. He did not reject the need for experimental verification of the results of his experiments on mice, however.

The problem of the inheritance of conditioned reflexes is just as important as it is difficult. If the inheritance idea is verified, then one of the most important storehouses of mechanisms of unconditioned reflexes of higher nervous activity will be explained.

Investigators must utilize more extensively and creatively the objective method in the study of conditioned reflexes to formulate methods which correspond to the intricate mechanisms of higher nervous activity. This method holds the key to the possible explanation of those enigmatic phases of "mental activity" in humans and animals about which Darwin was thinking, and which became even more interesting as a result of experiments conducted by I. P. Pavlov.

The phylogenetic and ontogenetic development of functions are perennially linked by the conditions under which an organism exists. Both these processes, therefore, are accomplished generally along similar lines. Darwin called attention to this; his followers, Muller and Haechel, formulated the so-called biogenetic law. This law does not have any absolute significance, and is extended to the most general features of phylogenetic and ontogenetic development. Nevertheless, any results of investigations concerning the ontogenesis of functions may reveal their phylogenesis to some extent.

For example, A. A. Volokhov showed that the formation of motor reflex reactions in embryogenesis occurs with the same general regularity as the formation of conditioned reflex activity in adult animals. His conclusions were based on results of many experiments. The results of A. A. Volokhov's studies confirm the view of I. P. Pavlov and L. A. Orbeli that investigations conducted to determine the dynamics of conditioned reflexes assist in understanding the process of the formation of reflex activity in general, both in phylogenesis and ontogenesis.

Significant investigations of the ontogenesis of higher nervous activity in humans and animals have been conducted in the laboratories of the following people: N. I. Krasnogorskiy, A. G. Ivanov-Smolenskiy, L. A. Orbeli, A. A. Volokhov, E. A. Astratyan, P. K. Anokhin, N. N. Kasatkin, M. M. Kol'tsova, V. A. Troshikhin, A. T. Khudorozheva, and others. These investigations aroused great interest and they have been devoted to clarification of the ontogenesis of the signal systems.

Ecological aspects of the study of the ontogenesis and phylogenesis of higher nervous activity seem to have borne results. Particular attention is being given, in the laboratories of D. A. Biryukov, A. D. Slonim, and others to the investigation of animals which are related but which live under varied conditions. These investigations advantageously supplement the comparative physiological investigations of the mechanisms of higher nervous activity, revealing the role which ecological factors play in the formation of this activity in the processes of ontogenesis and phylogenesis.

In conclusion, this article says that it has stressed the importance of evolutionary theory for one segment of physiology only. It is known that this theory has exerted a progressive influence on physiology as well as on all branches of biology, not to mention the fact that it has supplied one of several natural scientific bases for dialectic materialism. It is justifiable to say, therefore, that the USSR has become the second home for the evolutionary theory of Charles Darwin.

148. Lenin's Application of Philosophy to Natural Science

"V. I. Lenin on the Connection Between Philosophy and Natural Science," by A. Ye. Furman, Chair of Dialectic and Historical Materialism, Moscow State University; Zoologicheskiy Zhurnal, Vol 39, No 4, Apr 60, pp 1-11

The Soviet people celebrating the 90th anniversary of the birth of V. I. Lenin are said to be under conditions favorable for the building of a Communist society. The Communist society which is being established will offer further confirmation and realization of Lenin's teachings. Lenin's works are the fountain of ideas which light the way to human progress and happiness the author says. Soviet scientists have placed science at the disposal of Communist construction, and in trying to solve various problems encountered in daily life, they have again and again found inspiration in Lenin's ideas.

All works of V. I. Lenin are important, not just his writings which concern the development of modern natural science and discuss the development of biological sciences. All Lenin's works offer guidance on proper utilization of dialectic materialism and successful solution of many concrete theoretical and practical scientific problems.

The author dwells on one of Lenin's ideas: the connection between natural science and philosophy. First, Lenin based the uninterrupted bond that exists between philosophy and natural science on their historical development. Second, Lenin showed that the only scientific theoreyical basis for modern natural science is dialectic materialism. And third, Lenin paid particularly great attention to an explanation of how natural scientists, and all other scientists, can utilize dialectical materialism in solving concrete questions arising in the areas of their scientific interest.

Philosophy and natural science are two sides of a single process of cognition. Natural science is the result of human activity. People create natural science. Furthermore, all people have a definite world outlook. People differ in their world outlook. In character and origin, the world outlook may be philosophical, religious, or naively realistic, or it may consist of natural historical materialism. The world outlook of a people is reflected by their work, in their attitude toward the outside world, and in their efforts to solve theoretical and practical problems. The world outlook determines the way people approach the subjects under consideration and the manner in which they perceive the phenomena of the outside world.

Natural science is basically antagonistic to a religious world outlook. Natural science, in our time, is usually based either on philosophical materialism or on natural historical materialism.

Philosophy is necessary to natural science; if a scientist for some reason does not make use of scientific philosophy, then he either creates his own "philosophy" or becomes captive of a vagabond philosophy or some other "odd" philosophy.

The character of the philosophy of a natural scientist can be seen in his approach to the subject under investigation. A natural scientist-metaphysicist who is convinced that species do not undergo any variation does not seek in nature symptoms of their variability; when he does encounter them, he often finds he cannot comprehend their significance and make correct interpretations.

Science can be genuine only when it describes phenomena in an ordinary manner, explains them and derives from them definite general conclusions. Correct scientific conclusions and explanations of natural phenomena are impossible, however, without philosophy.

There was a period in the history of society when natural scientific and philosophical knowledge existed inseparably. Increased class antagonism, however, and increasing division of labor led to the point at which they became resolved into special branches of intellectual activity. The two sides of a single process of cognition, philosophy and natural science, appeared to have been violently torn asunder. Contradictions which arose between philosophy and natural science consequently asumed an antagonistic form. Such a seemingly "abnormal" situation appears to be understandable. In a society in which class struggle exists, everything indivisible is dissociated and the disunited parts are pitted against each other in an antagonistic manner: production against need, productive forces against the rate of production, mental work against physical work, etc.

Many theoretical hypotheses were formulated twice: first by natural philosophers and then by natural scientists. But solutions of these hypotheses by philosophers were often abstract in form and they remained inaccessible to natural science. In natural science these problems were decided with great difficulty. When knowledge of living nature was accumulated, the classification of vegetable and animal organisms led biologists closer to the theory of life, but they were unable to give it a correct, scientific form. The result was that biologists borrowed hypotheses from philosophers, developed this theory by using their own resources. In discussing this situation, V. I. Lenin wrote: "In our time, the idea of development and evolution has become almost entirely a part of social consciousness, but in a different way: through the philosophy of Hegel. However, this idea was presented by Marx and Engels more thoroughly and is richer in content than the current idea of evolution."

There are two principal trends in philosophy: materialistic and idealistic. Internally and organically natural science is connected with materialism. Materialism, in its turn, is antagonistic to superstition and bigotry. Idealism is alien and antagonistic to science. But it cannot carry on a successful fight against materialism without taking into consideration new discoveries in natural science. But idealism cannot be reconciled with such cornerstones of natural scientific hypotheses as the idea that nature existed before man came into being, that people think with the aid of their brain, that sense perceptions are the result of the effect of environment on human organs of sensation.

Idealism is nurtured by difficulties encountered by science, by its defects, by problems that it has not yet solved. But progress in various sciences will lead materialism to inevitable victory. Furthermore, the struggle between idealism and materialism in natural science is a reflection of a class struggle within human society.

Idealism has its roots within circles of the reactionary, exploiting classes. It also has gnosiological roots. The gnosiological roots of idealism, exposed by V. I. Lenin, are very significant in the struggle for materialism in natural science.

Vitalism and physiological idealism are one and the same thing. They differ in one form only: they parasitize different problems of biological science. From this, it can be concluded that in the struggle of idealism and materialism, natural science cannot remain indifferent. In other words, natural science must adhere to "partyism," must openly defend the interests of the forward looking, advanced class of society, a class which is carrying on a fight for a more progressive social order.

Natural science depends on philosophy. But the development of philosophy is dependent on the progress made by natural science. Therefore there is an interaction between natural science and philosophy. Engels said that materialism has always been forced to change its form with every new discovery that has been made in natural science. V. I. Lenin said "Every science has had its beginning with metaphysics. Metaphysicists-biologists have been trying to discover the meaning of life and of what significance the life force is. Metaphysicist-psychologists have been searching for a soul. This does not make sense: we cannot carry on a discussion about a soul without making an attempt to explain the mental process."

As time passed, science reached a high level of development. Consequently, metaphysical materialism became helpless and was unable to solve the philosophical questions in natural science. It is not within the domain of metaphysical materialism to solve such questions as the origin of life, the origin of consciousness, etc. To solve these questions, metaphysical materialism found refuge in the sublimation of all nature. Dialectics, developed by Hegel, was found to be superior to metaphysical materialism in solving a number of questions.

The inability of natural scientists to change from metaphysical materialism to dialectical materialism led them to idealism. New concepts of the structure of matter, of motion, and of space and time, brought about by new discoveries in physics, could have been comprehended from the viewpoint of dialectical materialism only. Ignorance of dialectical materialism is the reason that physics became a captive of idealism.

Every kind of unscientific, idealistic philosophy usually retards the development of natural science and creates a crisis in all sciences. Dialectical materialism only, the philosophy of the working class, offers unlimited freedom for the development of scientific knowledge.

In characterizing the crisis that physics faced at the end of the 19th Century and at the beginning of the 20th Century, V. I. Lenin showed that dialectical materialism could have prevented that crisis. But the prevalent world outlook at that time was the bourgeois world outlook, which made the free utilization of Marxist dialectics and the theory of cognizance impossible.

A scientist studying natural phenomena, ordinarily utilizes the world outlook of the class which he serves. He thereby expresses the class attitude toward the phenomena under investigation. Bourgeois science must therefore be cleansed of ideological elements before everything in it can be accepted.

Lenin said that "Professors in economics are nothing more than scientific lackeys of the capitalist class and professors of philosophy are scientific lackeys of theologians."

The peaceful coexistence of capitalism and socialism presupposes not only an increase in trade, but also the exchange of scientific information. Scientific achievements in capitalistic countries cannot be ignored. Peaceful coexistence of the two social systems is not based on ideology. In utilizing bourgeois science, it is necessary to ignore bourgeois ideology which has unavoidably penetrated it. Differentiation must be made where the questions of "pure" natural science end and where the questions of ideology and world outlook begin.

To reject scientific achievements in bourgeois natural science is just as harmful for Communism as to accept bourgeois idelogy. A profound knowledge of dialectical materialism can guarantee the proper solution of each individual question.

V. I. Lenin discussed two possible ways in which natural scientists can successfully arrive at dialectical materialism. A high level of scientific development itself, he said, will lead natural scientists to dialectical materialism. The second way concerns studying, mastering, and accepting dialectical materialism consciously. Conditions for

mastering dialectical materialism exist in a socialist society only; in capitalist countries, sufficient conditions are absent. Mastering dialectical materialism will be the first step toward unifying philosophy and natural science.

There is a discrepancy between familiarity with dialectical materialism and the ability to apply it skillfully. Often, scientists, in their attempts to apply consciously the dialectic to solve scientific problems, make more errors than they made prior to acquiring that knowledge because scientists attempt to apply dialectical materialism without comprehending its essence and its creative characteristics. Dialectical materialism is not a ready-made scheme to which natural scientific facts must conform, but is a guiding light for proper orientation to these facts. V. I. Lenin's idea concerning the unity of dialectical materialism, logic, and the theory of cognition is very valuable in that respect.

The application of dialectical materialism to biological sciences signifies first of all that their specificity must be considered. Profound knowledge of problems which characterize the development of the organic world, therefore, is an important step in the application of dialectical materialism to biological sciences. A theory of the development of the organic world has for biological sciences approximately the same significance as the development of historical materialism for social sciences. Feeble attempts to solve the problems of a general theory of development of the organic world are one reason that successful understanding of dialectical materialism and its application to individual branches of biology, is being retarded. V. I. Lenin discussed all questions of dialectical materialism and indicated how to use them, avoiding dogmatism, sophistication, and metaphysics.

Scientific problems cannot be solved without any attempt to utilize dialectical materialism. In our time, scientists who have not mastered dialectical materialism will not be able to cope with newer problems which Communist construction is placing before science.

149. Elections in Academy of Medical Sciences USSR

"The 14th Session of the General Assembly of the Academy of Medical Sciences, USSR, Completed Its Work", (Unsigned Article); Moscow, Meditsinskiy Rabotnik, 2 Feb 60, p 1

Election of 23 active members and 15 corresponding members to the Academy of Medical Sciences USSR was announced. The elections for the new staff of the presidium of the academy were also announced.

Newly elected Active Members are: A. B. Aleksanyan, V. G. Baranov, A. F. Bilibin, N. N. Blokhin, G. Y.. Vladimirov, M. F. Glazunov, V. M. Zhdanov, G. A. Zedgenidze, A. D. Zurabashvili, V. M. Karasik, N. A. Krayevskiy, A. V. Lebedinskiy, N. S. Molchanov, V. K. Navrotskiy, I. R. Petrov, A. I. Savitskiy, O. D. Sokolova-Ponomareva, M. A. Topchibashev, V. L. Troitskiy, I. N. Filimonov, L. K. Khotsyanov, A. I. Cherkes, and M. P. Chumakov.

Newly elected Corresponding Members are: M. L. Belen'kiy, I. F. Berezin, A. A. Voytkevish, O. V. Kerbikov, V. V. Kovanov, N. N. Litvinov, G. M. Maruashvili, L. S. Persianinov, A. I. Rakov, S. M. Ryss, V. A. Fanardzhyan, A. N. Filippovich, F. V. Shebanov, A. A. Shmidt, and Ye. V. Shmidt.

N. N. Blokhin was elected president of the Academy of Medical Sciences USSR, replacing A. N. Bakulev; V. D. Timakov and V. N. Orekhovich, vice-presidents; V. M. Zhdanov, Academician-Secretary. V. Kh. Vasilenko, . . . G. V. Vygodchikov and N. A. Krayevskiy were elected department Academician-Secretaries.

The above-named officers as well as V. V. Parin and G. P. Rudnev were elected to the Presidium of the Academy of Medical Sciences USSR.

150. K. K. Plaude Elected President of Academy of Sciences Latvian SSR

"Resolutions of the Presidium of the Academy of Sciences Latvian SSR", by J. Magone; Riga, Izvestiya Akademii Nauk Latviyskoy SSR, No 2 (151), 1960, p 207

At the yearly meeting of the Academy of Sciences Latvian SSR, held on 11 February 1960, new officers were elected. Academician Karl Karlovich Plaude, professor and Doctor of Technical Sciences, was unanimously elected president. Academician Petr Ivanovich Valeskaln, formerly academician-secretary, was elected vice-president.

VII. METALLURGY

Physical Metallurgy

151. X-ray Studies of Beryllium Bronze During Age-Hardening

"Age-Hardening of Beryllium Bronze," by L. Ye. Vinnichenko, Trudy Chelyabinskogo Instituta Mekhanizatsic i Elektrifikatsic Sel'skogo Khozyaystva (Works of the Chelyabinsk Institute of the Mechanization and Electrification of Agriculture), No 7, 1959, pp 314-326 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 1.2091)

X-ray methods were used to investigate the changes of thermal electromotive force, microhardness and Hall coefficient of beryllium bronze (96.92 percent copper, 2.49 percent berillium, 0.036 percent nickel, 0.42 percent iron) during age-hardening. A study was also made of the change of mechanical properties and electrical resistance and of the effects of neutron exposure.

152. G. V. Samsonov Receives Prize For Monograph On Silicides of High-Melting Metals

"Results of 1959 All-Union Competitions for the D. K. Chernov, N. A. Minkevich, and P. G. Sobolevskiy Prizes," by Eng Ye. M. Merzhanova; Moscow, Metallovedeniye i Termicheskaya Obrabotka Metallov, No 4, Apr 60, pp 62-64

Prof G. V. Samsonov, Doctor of Technical Sciences (Institute of Powder Metallurgy, Cermets, and Special Alloys of the Academy of Sciences Ukrainian SSR), was awarded a P. G. Sobolevskiy Prize of the third degree for the monograph Silitsidy i Ikh Ispol'zovaniye v Tekhnike (Silicides and Their Application in Technology). This monograph is the first USSR work which systematically treats problems pertaining to the nature and properties of silicides of high-melting metals.

153. Cyclone Method of Smelting Found Advantageous

"Results of Scientific Activity at the Academy of Sciences Kazakh SSR During 1959 and Current Tasks," by Academician Sh. Ch. Chokin, Academy of Sciences Kazakh SSR; Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, Vol 16, No 5, May 60, pp 12-23

"Power engineers and metallurgists of the Academy of Sciences Kazakh SSR, together with workers at the Balkhash Mining and Metallurgical Combine have successfully carried out experiments on cyclone smelting of copper concentrates. At a pilot-plant installation, the rated output was obtained. Experiments conducted over a long time confirmed the correctness of indexes determined in theoretical and experimental investigations. A high efficiency of the process was achieved. It was established that the amount of fuel used for smelting comprises 15.3%, as compared with the 22.2% required for smelting in reverberatory furnaces; mattes produced contain 1.4-1.6 times more copper than those resulting from smelting in reverberatory furnaces.

"At the Ust'-Kamenogorsk Lead-Zinc Combine, a vacuum process for the production of selenium has been introduced. Work has been conducted on the production of rare metals (cadmium, indium, etc.) from dusts obtained in lead production. Amalgam metallurgy methods are applied for the recovery of these metals."

154. Cyclone Method of Smelting

"The Cyclone Smelting of Copper Sulfide Concentrates," by A. V. Tonkonogiy, I. A. Onayev, I. P. Basina, and M. I. Vdovenko, Academy of Sciences Kazakh SSR; Yu. K. Pobedonostsev, A. N. Polyakov, V. B. Meyerovich, and M. G. Revazashvili, Balkhash Mining and Metallurgical Combine; and I. G. Durnovo and V. V. Tsyganov, Kazakh SSR State Institute for Design and Planning of Nonferrous Metals Industry Establishments [Kazgiprotsvetmet]; Moscow, Tsvetnyye Metally, Vol 33, No 3, Mar 60, pp 20-28

The design, construction, and operation of the cyclone furnace installed in 1957 at the Balkhash Mining and Metallurgical Combine are discussed in detail. This furnace, which is said to be the first of its type constructed in the USSR, is referred to as being on a pilot-plant ("semiindustrial") scale. On the basis of the material balance determined in operation and other characteristics of the process, a comparison is made with the smelting of copper sulfide concentrates in reverberatory furnaces and furnaces for smelting in the suspended state [fluidized bed], such as those in operation at Outokumpu (Finland) and Harjavalta (Finland). Some of the advantages

of the cyclone method, according to the authors of the article, are easy control of the extent of desulfurization (also of the rate of evolution of SO_2) and facility of the recovery of by-products (zinc, lead, and rare metals). In tests conducted at Balkhash, it was established that there is a considerable concentration of lead in the dust collected behind the exhaust (a lead content in the dust amounting to 14.77% is reported) and also that there is some rhenium in this dust (0.0327% of Re).

155. Pressing and Sintering Boride Powders

"Pressing and Sintering Boride Powders," by Engr B. N. Babich, K. I. Portnoy, Candidate of Technical Sciences, and Prof G. V. Samsonov, Doctor of Technical Sciences; Moscow, Metallovedeniye i Termicheskaya Obrabotka Metallov, No 1, Jan 60, pp 31-35

It is concluded that the logarithmic relationships between the relative volume and compacting pressure which are valid for metals apply to the compacting of powders of titanium boride, chromium boride, and the solid solution $(Ti, Cr)B_2$. These materials exhibit a high elastic aftereffect; the observed type of relationship between the elastic aftereffect and the pressure can be ascribed to the high brittleness and low ductility of the borides. Further compacting of the boride blanks during sintering involves flow of particles into pore spaces as soon as temperatures have been reached at which surface tension forces exceed the [yield] strength of particles that have passed into the plastic state. The possibility is indicated of performing pressing and sintering operations separately instead of applying the complex and expensive method of hot pressing.

156. Continuous Rolling of Wide Titanium (VT-1D) Sheet

"Production of Wide Cold-Rolled Sheet Made of Alloy VT-1D," by V. F. Kalugin, V. K. Barziy, T. S. Kuzina, and B. N. Popov, State Committee on Aviation Technology of Council of Ministers USSR; Moscow, Titan i Yego Splavy, Metallurgiya Titana, No 2, 1959, pp 133-144

A technological process for continuous rolling of wide (1,600-2,000-mm) sheet made of titanium alloy VT-1D is described in detail. Principal operations are as follow.

Melting ingots (400-415-mm diameter, 1,550-1,870 mm length, 884-1,055 kg) in a tungsten-electrode arc furnace.

Heating ingots in a mazut furnace to 1,000°C (total heating time, 7.5-9 hr) and forging into slabs on a 4,000-T press.

Heating milled slabs (110 x 720 x 2,200 mm) in the 1,120-1,240°C zone, soaking in the 1,240-1,230°C Zone (total heating time, 1.0-1.5 hr).

Hot-rolling on a continuous ten-stand mill according to the schedule: 110 → 76.1 → 55.01 → 35.03 → 23.03 → 12.5 → 8.04 → 5.74 → 4.17 → 3.47 → 3.38. Temperature at the end of rolling, 800-740°C; speed of sheet leaving tenth stand, 6 m/sec.

Cutting into sheets and annealing in a gas conveyer furnace at 700°C for 10 min.

Pinch rolling with 2-4% reduction.

Pickling under the following conditions: first bath with 18-20% H_2SO_4, bath temperature, 80-85°C, pickling time, 10 min; second bath with 18-22% H_2SO_4 and 1% NaF, bath temperature, 60-70°C, pickling time, 5-10 min.

Cold-rolling on a 2180 mill into 1,600-2,000-mm wide sheet with 35-40% total reduction according to the schedule: 2.25 → 1.96 → 1.90 → 1.80 → 1.70 → 1.56 → 1.50 → 1.48 → 1.45 → 1.39 → 1.35.

Intermediate annealing at 620-650°C for 10 min.

Cold-rolling on a 2180 mill according to the schedule: 1.35 → 1.25 → 1.20 → 1.15 → 1.10 → 1.08 → 1.07 → 1.05 → 1.04.

Finish annealing followed by pickling straightening.

Sheet produced by the above process has the following properties: tensile strength, 54.7-57.6 kg/mm^2; yield point, 45.3-50.8 kg/mm^2; relative elongation, 35.7-48.3%.

VIII. PHYSICS

Atomic and Molecular Physics

157. Chemical Kinetics of Molecules

"Spectroscopic Investigation of Oscillatory Energy Transfer in Collisions of Complex Molecules," by S. O. Mirumyants and B. S. Neporent; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 5, May 60, pp 514-515

A general analysis of oscillatory energy transfer in both directions: loss and acquisition of energy by excited molecules was carried out. Experiments concerned the stabilization of excited molecules of 3-dimethylamine-6-amino-phthalimide in their collisions with foreign gas molecules and their effect on the yield of vapor fluorescence of the studied substance during excitation at various wave lengths in a wide spectral range. It was shown that the efficiency of collision in the sense of energy exchange is in a monotonic relation to the value of Van-der-Waals constant of molecular interaction with foreign gases. It was established that the inverse energy conversion of foreign gas molecules into oscillatory energy of the tested molecules occurs with much less efficiency than the direct process.

Mechanics

158. Gas Dissociation Behind a Shock Wave

"Variation of Gas Parameters at Uneven Dissociation Behind a Shock Wave," Yu. P. Lun'kin, Physicotechnical Institute, Academy of Sciences USSR, Leningrad; Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 6, Jun 60, pp 622-626

It is suggested to add a supplementary relaxation equation to the usual state equation of a diatomic gas for the case of uneven dissociation. The relaxation equation is derived and an approximate solution of the system of equations expressing the unbalanced gas dissociation behind a shockwave is obtained.

159. Relaxation in an Isolated System of Harmonic Oscillators

"On the Relaxation of the Vibrational Motion in an Isolated System of Harmonic Oscillators," by A. I. Osipov, Moscow State University; Moscow, Doklady Akademii Nauk SSSR, Vol 130, No 3, 21 Jan 60, pp 523-524

During an initial period (τ_1) a quasistationary Boltzmann distribution with temperature is established, depending on the initial number of vibrational quanta, and independent of the other initial conditions. In this process, the main elementary event during the collision of oscillators is the exchange of vibrational quanta, whereby the whole number of vibratory quanta remains unchanged. Once the quasistationary Boltzmann distribution has been established by the elementary process of the transition of the energy of reciprocal motion into vibratory motion, the relatively slow process of the evolution of the quasistationary Boltzmann distribution in the direction of equilibrium (τ_2) begins. The distribution function, which remains a Boltzmann type throughout, varies its temperature from an initial to a terminal value. The establishment of equilibrium in an arbitrary system of diatomic molecules would also follow this scheme if $\tau_2 >> \tau_1$.

Nuclear Physics

160. Spectrometer for Nuclear Resonance

"Spectrometer for Nuclear Magnetic Resonance in Intermediate Fields," by V. V. Frolov; Leningrad, Vestnik Leningradskogo Universiteta, No 10, Seriya Fiziki i Khimii, No 2, 1960, pp 49-54

A device is described permitting the study of signals of nuclear magnetic resonance in liquids at fields below 150 oersted. The resolving line width of the device is 7 cycles at 35 oersted. The obtained signal-to-noise ratio is close to the theoretical one.

161. Focusing of a Diverging Beam

"Inhomogeneous Magnetic Fields for Focusing of a Divergent Charged Particle Beam," by V. R. Saulit and V. A. Unt; Leningrad, Vestnik Leningradskogo Universiteta, No 10, Seriya Fiziki i Khimii, No 2, 1960, pp 28-33

Focusing properties of an inhomogeneous magnetic field in one-dimensional mirror symmetry have been analyzed in Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 18,233 (1954); Ibid., 20, 374 (1956). The general condition

for an aberrationless focusing of a plane charged particle beam was expressed by a nonlinear integral equation which could be solved. A type of magnetic field was found permitting the solution of its equations without the previously required numerical integration. An example for a particular case is presented.

162. Measurements of Gamma Intensity

"Absolute Measurements of Intensity of High-Energy Gamma Radiation by the Pair Difference Method," by I. N. Usova, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 6, Jun 60, pp 665-671

During absolute measurements of radioactive capture intensity of the synchrotron the Physics Institute (W_{max} = 260 mev), it was found that intensity values obtained by the pair difference method were more than twice the values obtained by means of a thick-walled graphite chamber. The reason for this discrepancy lies in disregarding the photoeffect of multiple scattering of electrons in converters during intensity measurements by pair difference. By taking the above effects under consideration, values obtained by both methods coincide within the accuracy of measurement errors.

163. Ring Type Accelerator

"A Ring Type Accelerator With a Vertically Increasing Magnetic Field," by A. P. Fateyev and B. N. Yablekov; Atomnaya Energiya, Vol 8, No 6, Jun 60, pp 552-553

An accelerator with a vertically increasing and constant in time controlling magnetic field is described and the stability of the orbiting particles analyzed. The magnetic system consists of elements of equal periods, each one subdivided into two sections separated by fieldless rectilinear gaps. The directions of the magnetic filed are opposite in two adjacent sections affecting a change of sign of the curvature of the orbit. The change of signs is supposed to stabilize the orbit, and the vertically increasing magnetic field shifts the particle upwards while keeping the perimeter of the orbit constant. It is expected that with this accelerator design, it will be possible to accelerate electrons in opposite directions and to realize head-on collisions.

164. Electron Capture by Protons

"Electron Capture by Protons in Inert Gases," by V. V. Afrosimov, R. N. Il'in, and Ye. S. Solov'yev, Physicotechnical Institute, Academy of Sciences USSR, Leningrad; Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 6, Jun 60, pp 705-710

Processes of electron capture by ions in ion-atom collisions were studied. The cross-section of one electron capture by protons in He, Ne, Kr, and Xe and the cross-sections of two electron capture in Ar in the range of 10 to 180 kev were measured. It was found that the cross-section of two electrons drops with increasing energy much faster than the cross-section of one electron capture. The angular distribution of fast hydrogen atoms and H^- ions originating from the capture of one or two electrons by protons was studied, as well as the angular distribution of protons, scattered in Ar without change of charge. It was concluded that a capture of two electrons requires a closer approach of the proton with the atoms, than for a one-electron capture. Elastic and unelastic proton scattering connected with transitions $H^+ \rightarrow H^0$ and $H^+ \rightarrow H^-$ were also studied.

165. Latest Soviet Research Reactor

"The 50,000 KW Research Reactor SM," by S. M. Feynberg, S. T. Konobeyevskiy, N. A. Dollezhal', I. Ya. Yemel'yanov, V. A. Tsykanov, Yu. M. Bulkin, A. D. Zhirnov, A. G. Filippov, O. L. Shchipakin, V. P. Perfil'yev, A. G. Samoylov, and V. I. Ageyenkov; Moscow, Atomnaya Energiya, Vol 8, No 6, Jun 60, pp 493-504

The construction of the Soviet research reactor SM with a neutron flux of $2.2 \cdot 10^{15}$ neutrons/$cm^2 \cdot$ sec. is described. The strong neutron flux and gamma rays will permit many experiments in nuclear physics, among them the obtaining of new transuranic elements; study of properties of fissile and fertile materials; and studies of neutron and gamma spectra and of short-lived radioactive isotopes. The reactor has a high ratio of maximum neutron flux to heat power, $4.4 \cdot 10^{10}$ neutrons/$cm^2 \cdot$ sec $\cdot$ kw. In the description principal attention is drawn to the engineering problems in the reactor design.

166. Plasma Oscillations

"Oscillations of a Thin Ring-Shaped Plasma Pinch in a Magnetic Field," by Yu. V. Vandakurov, Physicotechnical Institute, Academy of Sciences USSR, Leningrad; Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 6, Jun 60, pp 711-722

Axisymmetric oscillations of a thin ring-shaped plasma pinch without active resistance are analyzed in a magnetohydrodynamic approximation. Allowance is made for the compressibility of the plasma. The frequencies of the pinch oscillations located inside of an ideally conducting cast are found, as well as the oscillations of a plasma coil without a casing. In the second case, a pinch is considered which is somewhat different from a circular one and which gives the opportunity to vary the character of the sideward retaining magnetic field. It is shown that the presence of the radical component of the side field in the plane containing the axial line of the pinch leads to a deterioration of stability conditions.

Optics and Spectroscopy

167. Comparison of Classical and Quantum Theories of Light

"Coincidence of Results of Classical and Quantum Theories of Interaction of Light With an Harmonic Oscillator," by V. P. Gribkovskiy and B. I. Stepanov, Institute of Physics Academy of Sciences Belorussian SSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 5, May 60, pp 529-533

T. P. Kravets (Trudy po Fizike [Works in Physics], (1959)) established that the absorption coefficient, an integral in frequency, (Kravets integral) depends neither on frequency nor on intensity of the excited light. The results of quantomechanical computations of interaction of light with an harmonic oscillator are presented. In all computations, the oscillator with all its infinite coupling of energy levels is considered as an entity. Some new results were obtained. In a dipole approximation, the quantum theory results with respect to optical properties of an harmonic oscillator fully coincide with results of the classical theory.

168. Soviet Achievements in Molecular Luminescence During 1958-1959

"Opening Address" (Eighth Conference on Luminescence, Minsk, 19-24 October 1959), by V. L. Levshin; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 5, May 60, p 488-491

During the last year, studies dealing with the relations of luminescence to light scattering and thermal radiation were continued. The energy transformation inside the molecules and various values of relations between

electron motion and oscillations of atomic nuclei and the interaction of light with a harmonic oscillator were given much attention, particularly by M. A. Yel'yashev, B. S. Neporent, and B. I. Stepanov. Much work was devoted to intermolecular energy transfer by means of resonance and energy migration by means of excitons. B. Ya. Sveshnikov and associates clarified the role of diffusion and studied depolarization of glowing in energy migration. A. N. Terenin and V. L. Yermolayev discovered a new case of molecular resonance between a triplet level leading to prolonged luminescence, as well as intermolecular energy transfer along triplet levels of complex molecules. V. M. Agranovich and N. D. Zhevandrov studied different processes concerning excitons. A. N. Sevchenko, G. P. Gurinovich, and A. M. Sarzhevskiy established a mirror symmetry of polarization spectra. Much work was devoted to the study of glowing of organic scintillators under action of α and γ rays and electrons. In particular M. D. Galanin and associates studied the problem of luminescence yield under action of ionizing radiations and the reasons for their low yield.

Luminescence and absorption spectra of aromatic compounds at the temperature of liquid hydrogen were studied at the Ukrainian Academy of Sciences under the direction of A. F. Prikhot'ko. The fine structure of these spectra in frozen solutions in limiting hydrocarbons were studied by E. V. Shpolskiy and associates. Spectra of anthracene and its derivatives were under the investigation of A. S. Cherkasov, A. N. Sevchenko, L. V. Volodko, and D. S. Umreyko studied and interpreted spectra of uranyl solutions.

Important results were obtained on luminescence of chlorophyll by A. N. Terenin, A. A. Krasnovskiy, A. V. Karyakin, and V. B. Yevstigneyev, as well as by the Belorussian Academy of Sciences and G. N. Godnev, A. N. Sevchenko, L. A. Kravtsov, and others.

The glowing of vapors and gases and the energy transfer at molecule collisions in gaseous medium are reported by S. O. Mirumyants, B. S. Neporent, V. P. Klochkov, N. A. Borisovich, V. A. Tolkachev, P. A. Apanas'yev, and G. S. Kruglik.

V. K. Matveyev synthesized a new organoluminophor, Lumigen, whose orange-red color of luminescence permitted the application of luminiscence defectoscopy in the electrovacuum industry for revealing leaking spots in glass walls. The new method is more simple and sometimes more sensitive than the usual methods of mass spectroscopy.

169. Optical Properties of Water in Millimeter Range

"Measurement of the Coefficient of Reflection and the Dielectric Permeability of Water in the Millimeter Radiowave Band," by N. S. Zinchenko; Uch. zap. Khar'kovsk. un-t, 1959, 102, Tr. Radiofiz. fak. (Scientific Reports of Khar'kov University, 1959, Vol 102, Works of the Radiophysics Faculty), No 3, pp 81-87 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 6.7118)

Results are given of measurements of the coefficient of reflection, the dielectric permeability and the absorption coefficient of water at wave lengths of 13.6, 8.5, 6.3, and 4.3 millimeters. The measurements were taken with a transmitter-receiver combination, both components of which could be varied in height and inclination in relation to the reflecting surface. The method is described in detail. The results show a considerable dependence of the coefficient of reflection on wave length. This is explained by the anomalous dispersion of the waves [by the water] in this range. The measured values for the coefficient of reflection differ from the computed values by 3-6 percent for angles of incidence less than the angle of complete polarization. The measured values of the refraction index and absorption coefficient differ about 5-10 percent from theory. The good agreement between the computed and measured values of the conductivity indicates a dipole mechanism for the losses in the water.

170. Phosphors Excited by Cathode Rays

"Properties of ZnS-Mn, Ni, Cl Phosphors Under Cathode Ray Excitation," by A. I. Blazhevich, A. G. Zavrazhin, and A. V. Lavrov; Leningrad, Optika i Spektroskopiya, Vol 8, No 4, Apr 60, pp 550-553

The effect of Ni admixture on the glowing of luminophors ZnS-Mn and on the behavior of their attenuation curves at various content of chlorine was studied. It was shown that an increase of Ni concentration leads to a decrease of the hyperbolic quenching component and to the predomination of the exponential component.

171. Infrared Quenching

"Temperature Effect on Infrared Quenching," by K. S. K. Rebane and E. Sakarinen; Leningrad, Optika i Spektroskopiya, Vol 8, No 4, Apr 60, pp 545-549

Data on the infrared quenching coefficient $\mu(T)$ relation to temperature is presented for a number of phosphors. It is shown that the nonmonotonous $\mu(T)$ depends on the spectra of capture levels of phosphors and the quenching action of temperature and infrared light.

172. Luminescence of Diamonds

"Luminescence Spectra of Diamonds," by G. O. Gomon; Leningrad, Optika i Spektroskopiya," Vol 8, No 4, Apr 60, pp 521-524

Luminescence spectra of various diamonds from Soviet deposits were studied. It was found that the variety of luminescent color and intensity is related to the variation of the absolute and relative intensity of the blue and yellow-green components of the spectrum. The structure of the blue component remained mostly unchanged, while many variations were observed in the yellow-green band in the position of the head narrow line and in the structure of the long-wave component of the luminescence spectrum of various diamonds. It probably indicates stronger sensitivity of glowing centers, responsible for the yellow-green component, to the effect of impurities, or to other defects of the lattice.

173. Vibrational Spectra of Germanium Dioxide

"Vibrational Spectra of Germanium Dioxide Modifications," by V. V. Obukhov-Denisov, N. N. Sobolev, and V. P. Cheremisinov; Leningrad, Optika i Spektroskopiya, Vol 8, No 4, Apr 60, pp 505-510

Experimental studies of vibrational spectra of GeO_2 modifications showed that the vitreous modification of GeO_2 has the same hexagonal structure as the dissolved crystalline one. However, the sharp difference of the vibrational spectrum of the insoluble GeO_2 modification proves that this crystalline form has a different structure. An X-ray analysis shows a tetragonal structure. The absence of a combination scattering spectrum indicates a rather ionic character of the crystalline form of GeO_2.

174. Chlorophyll Spectra

"Infrared Chlorophyll Spectra and Its Analogs," by A. N. Sidorov and A. N. Terenin; Leningrad, Optika i Spektroskopiya, Vol 8, No 4, Apr 60, pp 482-491

Infrared absorption spectra were obtained of pheophytin, chlorophyll, Zn-, Ni-, and Cu-pheophytins as solid films and solutions in CCl_4 and in a mixture of pyridine +CCl_4. The introduction of a metallic atom into a pheophytin molecule produces considerable change in its spectrum, indicating that this atom acts not only on the closest atoms to which it is directly bound, but also on peripheral atom groups of the pigment molecule. It was concluded that the pyridine molecule forming a compound with chlorophyll combines directly to the central magnesium atom. The reaction of pyridine,

transferring by means of the magnesium atom on the whole chlorophyll molecule, leads to stabilization of the ketoform of its pentacycle ring. For the formation of a compound of chlorophyll with water, the central metal atom in the pigment molecule is not indispensable. However, a metal atom, particularly magnesium, activates the pigment molecule in relation to complex formation with water which appears in the stability of the forming compounds.

175. Anti-Stokes Component

"Anti-Stokes Component of the Spectrum of Combination Scattering of Compounds With a Hydrogen Bond," by L. N. Ovander; Leningrad, Optika i Spektroskopiya, Vol 8, No 4, Apr 60, pp 477-481

Combination scattering of light in compounds with a hydrogen bond is analyzed. It was shown that the structure of the anti-Stokes component should have the same structure as the Stokes component.

176. Combination Scattering of Light

"The Indicatrix of the Combination Scattering of Light," by I. I. Kondilenko, P. A. Korotkov, and V. L. Strizhevskiy; Leningrad, Optika i Spektroskopiya, Vol 8, No 4, Apr 60, pp 471-476

A simple derivation of G. Plachek's formulas [Releyevskoye Rasseyaniye i Raman Effekt (Rayleigh Scattering and the Raman Effect) 1935], determining the relation of the line intensities of combination light scattering to the observation angle and to the value of the depolarization degree of the lines is presented. The angular relation of the intensities of the lines of the combination scattering of carbon tetrachloride, benzene, and chloroform was established. The obtained experimental data are in good agreement with theory. The possibility of a new method for measuring the depolarization degree of lines of combination scattering is indicated.

177. Bromoform Spectrum

"Frequencies and Intensities of Bromoform in the Infrared Spectrum," by N. Ye. Gaponova, M. P. Lisitsa, and Yu P. Tsyashchenko; Leningrad, Optika i Spektroskopiya, Vol 8, No 4, Apr 60, pp 465-470

Results of quantitative studies of absorption spectrum of $CHBr_3$ in the range of 460 - 11,700 cm^{-1} are described. A comparison of $CHBr_3$ and $CHCl_3$ absorption spectra shows that the integral absorption in the bands of fundamental oscillations depends on the degree of polarity bonds determining the

the form of oscillations. The weakening of intensities in many harmonics related to the oscillation of certain bonds is expressed stronger the higher the degree of ionization of the latter. An anomalously high intensity of a compound vibration should be explained by its participation in Fermi resonance.

178. Study of Discharge in He

"Radiation of a Spark Discharge in Helium," by M. P. Vanyukov, A. A. Mak, and V. R. Muratov; Leningrad, Optika i Spektroskopiya, Vol 8, No 4, Apr 60, pp 439-445

The radiation of spark discharge provides valuable information on the channel temperature and concentration of charged particles from data on the intensity of spectral lines, their broadening and shift. It was found that the emission of a spark discharge in He ($p = 2.5$ atm., $V/L = 1.4 \cdot 10^{10}$ amp/sec) in the wave range of 2500 - 5500 Å is characterized in the beginning by a strong continuous background with an enhanced line He II 4686 Å and He II 3203 Å. The arc lines of He appear about 0.3-0.5 microsec later. Photoelectric equipment with a time constant $\sim 5 \cdot 10^{-8}$ sec and a spectral resolution of 0.2 Å facilitated the research. The spark as well as the arc lines were found strongly broadened due to the Stark effect. An approximative evaluation of electron concentration could be carried out from the width and shift of lines.

179. Luminescence of Chlorophyll

"Quantum Yield of Chlorophyll Luminescence in Various Solvents," by N. P. Ivanov, Physics Institute of the Academy of Sciences Belorussian SSR; Moscow, Izvestiya Akademii Nauk SSSR, Vol 24, No 5, May 60, pp 613-615

The variation of quantum yield of chlorophyll luminescence was studied in various solvents. For determining the quantum yield, luminescence spectra were measured and compared with a sample of known absorption of exciting light. The obtained data proved in first approximation that the type of the solvent does not affect the quantum yield in the case of fresh solutions, low chlorophyll concentration, and a short irradiation.

180. Luminescence Spectra of Chlorophyll and Pheophytin

"Optical Properties of Chlorophyll and Pheophytin at Low Temperatures," by L. A. Kravtsov, Physics Institute, Academy of Sciences Belorussian SSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 5, May 60, pp 610-612

The effect of temperature (+20 to -100°) on luminescence spectra and the red absorption band of chlorophyll a and pheophytin a solutions, as well as their relative luminescence yield, were studied. The solvents were isobutanol and petroleum ether, which remain transparent at low temperatures and have very different properties. The comparison of the obtained results showed that the drop of the relative quantum yield of chlorophyll a and pheophytin a in petroleum ether at a temperature of about -70° and the formation of a protrusion on the long-wave side of the red absorption band of these substances in the same solvent led to the suggestion that some aggregates of chlorophyll a and pheophytin a molecules are forming at these temperatures in petroleum ether. The new compound has its own absorption spectrum and it does not luminesce.

181. Twin-Focus Beta Spectrometer

"Some Characteristics of the Large Beta Spectrometer With Twin Focusing," by O. D. Kovrigin; Sbornik Leningradskogo Instituta Inzhenerov Zheleznodorozhnogo Transporta (Collected Articles of the Leningrad Institute of Railroad Transport Engineers), No 162, 1959, pp 150-170 (from Referativnyy Zhurnal -- Elektrotekhnika, No 8, 25 Apr 60, Abstract No 4.7035)

A description is given of a spectrometer with twin focusing and a radius of stable orbit of 500 millimeters. The measuring and stabilizing of the megnetic field, the force of which can be varied in the range 5-200 oersted, is treated in detail. A skeleton diagram of the magnetic-field stabilizer is also given. Electron band widths and trajectories are computed, and the variation of magnetic-field topography with field strength is discussed.

182. Hungarian Research in Photosensitive Papers and Films

"Photography Without Light," by E. T.; Budapest Magyar Nemzet, 14 Jun 60, p 5

In a description of a visit to the research laboratory of the Forte Photochemistry Industry (Forte Fotokemiai Impar, a factory in Vac, Hungary), it was reported that this laboratory, now 10 years old, has developed a colored photo paper which is now being test manufactured. Robert Zentel,

chief engineer, told of his trip to India where Forte products are sold. He said that the laboratory is now preparing a film with a sensitivity of 40 dynes, which "can take a snapshot with the light from a match." Zentel also spoke of infrared sensitive film, color photographs of the inside of the body as a diagnostic tool, and a photographic detection of bacteria, but he did not discuss the status of Hungarian research in these areas.

Solid State Physics

183. Self-Healing of Surface Defects in Copper Crystals at High Temperature

"On the High-Temperature Self-Healing of the Surface Defects of Crystals," by Ya. Ye. Geguzin and N. N. Ovcharenko, Institute of Chemistry, Khar'kov State University imeni A. M. Gor'kiy; Moscow Doklady Akademii Nauk SSSR, Vol 130, No 3, 21 Jan 60, pp 537-540

Although, depending on the initial surface condition of the crystal, a surface growth in conjunction with a facet with low surface tension might be feasible from the energy viewpoint, it is pointed out here that if the surface of a crystal has grown considerably, then a surface dimunition will take place according to that process which guarantees the most rapid reduction of the surface energy. This article is devoted to the second possibility, the reduction of the free surface energy of a crystal as a result of a leveling of a surface having macroscopic defects. The data obtained were based on a study of the mechanism and kinetics of the leveling of purposely produced surface scratches, evenly spaced and having a definite geometry. Average values for the surface self-diffusion of $D_s = 4 \times 10^{-6}$ 1×10^{-5}, and 3×10^{-5} cm^2/sec for temperatures of 750, 850, and 950 deg C, respectively, are in agreement with similar values reported in the literature (W. W. Mullins and P. G. Shewmon, Acta Metallurgica, Vol 7, 1959, p 163; Glostein and Rihnes [sic], Acta Metallurgica, Vol 7, 1959, p 224; Hackerman and Simpson, Trans. Farad. Soc., Vol 52, 1956, p 638)

IX. MISCELLANEOUS

184. New Members of Academy of Sciences USSR

"Additions to the Academy" (unsigned article); Moscow, Pravda, 11 Jun 60, p 2

"A general session of the Academy of Sciences USSR was held on 10 June 1960 at the Moscow House of Scientists. The purpose of the session was to select active members and to confirm corresponding members of the Academy of Sciences who were elected at general sessions of branches.

"Eleven new active members were elected to the academy after their candidacy was first thoroughly discussed at branch meetings. Those elected who are working in the field of physicomathematical sciences were B. P. Konstantinov (physics) and P. S. Novikov (mathematics); in geological-geographical sciences, Ye. K. Fedorov (applied geophysics); in biological sciences, Yu. A. Orlov (paleontology), N. M. Sisakyan (biochemistry of plants), and V. N. Chernigovskiy (animal and human physiology); in engineering sciences, A. Yu. Ishlinskiy, B. N. Petrov, and V. A. Trapeznikov, who are specialists in 'automatization,' and A. N. Vol'skiy (metallurgy and metallography); and in economics, philosophy, and law, P. N. Fedoseyev (philosophy).

"Fifty people elected at general sessions of branches, were confirmed as corresponding members of the Academy of Sciences USSR. Of that number, eight people belong to the Siberian branch."

185. Academy of Sciences Ukrainian SSR Reinforcing Development of Cybernetics

"On the Development of Work in Cybernetics in the Academy of Sciences Ukrainian SSR" (unsigned article); Kiev, Dopovidi Akademii Nauk Ukrains'koi RSR, No 4, Apr 60, p 549

The Presidium of the Academy of Sciences Ukrainian SSR, recognizing the fact that research in cybernetics in the institutes of the academy is not being adequately developed, has decreed the organization of the following new sections on cybernetics within the Institute of Mathematics to train the necessary cadres and create a material base for the future Institute of Cybernetics of the Academy of Sciences Ukrainian SSR: simulation of higher nervous activity (headed by M. M. Amosov, Doctor of Medical Sciences), dynamics and simulation of control systems (headed by A. I. Kukhtenko, Doctor of Technical Sciences).

The basic tasks of the Institute of Cybernetics, when it is finally organized in the near future, will be to study the theoretical principles of cybernetics (general theory of automata, algorithms and controlling systems, information theory, game theory, and theory of random processes), to study the principal problems in automation of production processes (technical and industrial cybernetics), automation of accounting and planning (cybernetic problems of economics), to study human higher nervous activity, theory of regulation in living organisms, simulation of sensory organs, and problems of mathematical linguistics and the theory of information machines (including the question of automatic diagnostics).

B. V. Gnedenko, Academician of the Academy of Sciences Ukrainian SSR, V. M. Glushko, Corresponding Member of the Academy of Sciences Ukrainian SSR, and Prof M. M. Amosov have been charged with working out the prospective organizational structure of the new Institute of Cybernetics.

The Presidium also ordered the organization as of 1 January 1960 of the following new sections in the computation Center of the Academy of Sciences Ukrainian SSR: automation of statistical accounting and planning (Section on Economic Cybernetics headed by V. S. Mikhalevich, Candidate of Physicomathematical Sciences) and technical cybernetics. V. M. Glushkov has been given the responsibility for general direction of works in cybernetics in the Computation Center as well as for the organization of the new sections.

186. Soviet Centralized Information Service Criticized

"On the Work of the All-Union Institute of Scientific and Technical Information" (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, No 6, Jun 60, p 124

The All-Union Institute of Scientific and Technical Information of the State Scientific and Technical Committee of the Council of Ministers USSR and the Academy of Sciences USSR in a short time has become the largest scientific information institution.

The institute issues the Referativnyy Zhurnal (Abstract Journal) in the physicomathematical, chemical, geological and geographical, biological, technical and economic sciences, the monograph series Itogi nauki (Achievements of Science), Ekspress-informatsiya (Express Information), and reviews on the most timely problems of engineering and specific economics.

At the same time, as the presidium has noted, there are substantial deficiencies in the work of the institute.

Referativnyy Zhurnal still does not cover a number of very important branches of science and technology (medicine, transportation, agriculture, the light and food industry, etc.) and does not completely throw light on the world scientific and technical literature. A lag in the publication

of indexes strongly decreases the possibility of practical utilization of the Referativnyy Zhurnal. The time lag between the receipt of sources and the publication of information from them is still too great.

Adequate measures have not been taken for popularizing and widely distributing the Referativnyy Zhurnal and the Ekspress-informatsiya, and as a result, the circulation of subscription publications of the institute is small. The development of general problems of information are being poorly worked out.

The presidium charged Prof A. I. Mikhaylov, director of the institute, with eliminating in the shortest time the deficiencies indicated; with concentrating primary attention on providing a more complete elucidation of the world scientific and technical literature, on increasing the quality of abstracts and reducing the time for preparing information publications and the reference indexes to them; and with developing machine information, first of all, in chemistry, machine building, and electrical engineering.

In the presidium's decree, a number of measures are outlined calling for the provision of the most effective utilization of the Referativnyy Zhurnal materials.

187. Bulgarian Research Facilities

"Sixty Scientific Research Institutes, Forty Experimental Stations," by K. F. R.; Budapest, Magyar Nemzet, 16 Jun 60, p 5

Academician T. Chernokolev, First Secretary of the Bulgarian Academy of Sciences, gave the following information to a Hungarian reporter during a recent visit to Budapest.

The Bulgarian Academy now has more than 60 scientific institutes; it has 40 experimental stations; and of the 7,000 workers in these, 2,000 do only scientific research. In addition to the academy institutes, there are 25 research institutes belonging to various ministries. Twenty-five institutes and 40 experimental stations work in agricultural sciences. Significant work is also done in geological research. "So far, our researchers have discovered iron ore, nonferrous metals, tin, lead, rare metals, uranium ore, and coal," Chernokolev reported.

188. Hungarian Scientific Publications Subject of Press Conference

"1,365,000 copies of Scientific Publications -- Press Conference of the Akademia Publishing House" (unsigned article); Budapest, Magyar Nemzet, 25 Jun 60, p 5

At a joint press conference of the Hungarian Academy of Sciences and the National Federation of Hungarian Journalists, introduced by Academician Lajos Ligeti (president of the academy book and periodical committee), Academician

Zoltan Csuros (secretary of the committee) reported on the work of the Akademiai Kiado (Academy Publishing House). The number of copies of publications was 1,365,000 in 1959. Seventy periodicals are published regularly, 29 of them in foreign languages. The Akademiai Kiado is responsible for 68 bilingual and multilingual dictionaries and has published them in more than 1,250,000 copies since 1951. The Akademiai Kiado has published 150 Hungarian scientific books (20 percent of the monographs and handbooks) in the German, Russian, and English languages. Export of foreign language publications in 1959 was 45 times that of 1954. Items to be published in 1960 will include a school Russian dictionary in 250,000 copies and a seven-language sports dictionary.

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